ELECTRICAL REVIEW

[ILLUSTRATED.]

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The "Iceberg" Electric Fan.

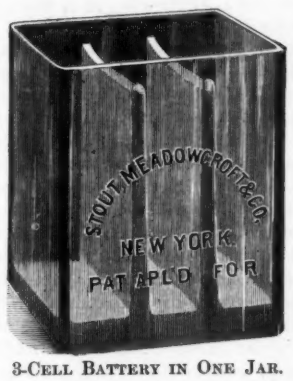
Among the thousand and one useful appliances which modern electricity has brought within the reach of the public, it is doubtful whether there is one which will insure so much solid comfort and be so readily appreciated as the article illustrated in this issue of the REVIEW. There is one universal want during the hot summer months—a refreshing breeze. All sufferers from the heat will appreciate this invention known as the "Iceberg Electric Fan." It is a handsome instrument, standing 14½ inches from the base to the top of the fan. It consists of an iron base with brass upright, upon which is placed a small electric motor, having attached a highly finished 9-inch brass fan. There are two binding posts in the base, to which are attached two wires leading from the battery which accompanies the fan. When the battery is attached, the fan revolves almost noiselessly at a high speed, and throws out a continuous breeze which may be felt more than 10 feet away. The battery will run the fan about four hours and may then be replenished in less than five minutes. The battery and fan are exceedingly simple, and may be operated by a child. The fans will give a breeze equal to 2,100 cubic feet per hour at a velocity of 3.6 miles per hour. Desks, parlors, bedrooms, counters, etc., will soon be ornamented by this desirable invention. On hot nights an "Iceberg" fan will be an addition to the bedroom that will bring cooling breezes, and, of course, pleasant dreams. As a present to a sick friend, one of these fans would certainly be most acceptable. The fan can be operated by any bichromate battery of three cells and upwards. The *B* battery, of Stout, Meadowcroft & Co., illustrated in Fig. 2, is very compact, and, although it has three cells, the box containing it measures only $4\frac{1}{4} \times 5\frac{1}{4} \times 6\frac{3}{4}$ inches.

The Electric Railway in Philadelphia.

The electric railway soon to be constructed along Belmont Avenue, Philadelphia, will present the novel sight of cars running without any apparent propelling force, free from annoyance of noise, smoke and dust. The motive power for the cars, which are to be run according to the Bidwell system, will be furnished from a station located somewhere on Belmont Avenue, outside the park. It could, if necessary, be carried over an indefinite distance. This system differs from other systems of electric railways in not passing the current through the rails. Guards made of lumber run along the inner side of the rails, and a broad covering projects toward the center, leaving a narrow slot in the middle of the track. Beneath this cover, and parallel with the rails, properly insulated copper conductors, of a semi-tubular shape, are placed. The current is conveyed from the dynamos supplying the power through wires to the terminus of the railway, where connection is made with the copper tubes, and a current is thus sent through the whole length of the road.

To propel the car, a receiving dynamo or electromotor is placed in the center of the car. Connection with the current is made by means of an iron tube passing down through the slot, with branches in either direction in the form of an inverted ⊥. On the end of each branch a small wheel, so placed as to run against the copper conductors, completes the connection, wires being run through the tube from the electromotor in the cars to the wheels. The electricity being passed through the circuit of the track, the operator has but to turn a lever to receive the current in the motor, which immediately revolves, and by an attachment with the wheels of the car propels it in either direction, according as the current is reversed or not. Through the reversal of currents the need of brakes is dispensed with. If necessary, the car can be brought to a sudden standstill, but the change can be effected as gradually as may be desired. There will, therefor, be no danger of running over persons on the track.

The avenue will be lighted with the same current, by running wires from the tubes to the lamps, as in ordinary street lighting, while the cars will be illuminated by running a wire from the motor to the incandescent lamps in the interior of the car, the whole power coming from the single current supplied by the stationary engines some distance away from the track. If it is desired to heat the cars, another draft is made on the current by passing the electricity through some poorly conducting substance, as German silver, the electrical energy being thereby dissipated in the form of heat. These connections are made by means of switches, so that no current may be made through the branch wires when the light or heat is not wanted.



3-CELL BATTERY IN ONE JAR.

THE "ICEBERG" ELECTRIC FAN.

An important feature of this railway for the park is the utter impossibility of trifling with the conductors and receiving injury from a shock. They are placed beneath the board flooring near the rails, and the only opening is the narrow slot, more than a foot distant, the whole being concealed from view. The road will be about a mile and a quarter long, and ten cars, carrying from 50 to 60 passengers, will be run. To furnish the power for these, and to light both the avenue and the cars, about 100-horse will be required.—*Ex.*

*** In Baltimore, Md., the Chesapeake & Potomac Telephone Company is laying a large number of underground wires to serve the western and northwestern part of the city. The wires start from the central office and run west along La Fayette Square. The underground wires are contained in lead pipes, each containing 100 wires. The two cables are laid in wooden boxes, and filled with asphalt.

Brauer's Dynamometric Brake.

According to the *Proceedings* of the Institution of Civil Engineers, London, two striking characteristics distinguish this brake, the invention of Mr. Brauer, from others of the same class. Firstly, it does not require when in action that its frictional surfaces should be constantly wetted; with ordinary wooden brakes this is absolutely necessary. Secondly, once the clutching action is established the brake regulates itself automatically, and further, there is not required, as with the ordinary brake, a long and cumbersome lever. An analogous arrangement to that of Mr. Brauer has been suggested by Mr. Kratz in his essay upon the dynamometric brake. In the Brauer apparatus, instead of wooden jaws hugging the rims of the pulley, an iron band is used for flat rim pulleys, and wire ropes for grooved pulleys. The apparatus is composed of the following assemblage of parts: 1st. The iron band or wire rope. 2d. The clutch-producing arrangement and the regulation of the tension of the clutch-producing bands or ropes. The clutch or pressure of the bands or ropes upon the surface of the rim of the pulleys produces a friction corresponding to the effective work of the motor. The moment of this friction multiplied by 2π gives the work produced per revolution. To calculate this it only needs to determine an equal moment given by the additional charge or weight p, augmented by the weight of the regulating organs, the two weights affixed to the axis of the pulley, and p the moment required to maintain the system in equilibrium. The iron band applied to an ordinary flat rim pulley is provided with four double guides to retain the band in position, which is fixed up from the underside by means of a stirrup bolt and link and a safety cord, in such a way as to allow the band to have a play of 100 millimeters. These safety measures can be modified according to local circumstances, and when the under part of the pulley or drum is inaccessible.

The following is a summary of the observations made by Mr. Burghardt, who has carefully tested Brauer's dynamometric brakes: Needle lubricators do not sufficiently lubricate the apparatus; tallow is preferable as the lubricating medium. The brake worked well during the time the temperature of the pulley-rim did not exceed 35° to 40° Centigrade, and even up to 80° Centigrade the action was still satisfactory, but the lubricating medium became too fluid, and was thrown off the grooves by the centrifugal force due to the speed of the pulley. The Brauer brake worked well for two hours with a load corresponding to 25 horse-power. Summary of the advantages and disadvantages of the Brauer brake over those of the ordinary description: 1. The necessity of continually cooling the pulley-rim by subjecting it to a stream of water, which is a great drawback to the use of ordinary brakes, is in the Brauer brake avoided. 2. The brake is not so cumbersome, and can be applied to motors *in situ* and in confined spaces. The oscillations are very limited, and consequently the observations are more exact than with the ordinary brake, and the diagrams obtained by the indicator are clean and clear, and easy to calculate. On the other hand, the Brauer brake is relatively rather more costly than those of the ordinary class, and it requires in its application a little more care than those of the ordinary and unscientific class.

Electric Brakes.

A few weeks ago mention was made in these columns, of an entirely new system of automatic continuous brakes worked by electricity. We expected by this time to have been able to describe the completed mechanism, which, if present appearances go for anything, is likely to cause no little sensation in the railway world. Work on such contrivances is, however, slow and patents have to be properly recorded before important secrets can be made public.

The new brake seems to resemble externally the Westinghouse automatic brake, though, as we understand, the principle is quite different.

As is well known, the Westinghouse brake, admirable as it is, has its imperfections like all other known mechanisms of a similar description. It is subject, as we know, to frequent breakdowns, owing to the failure of the hose-pipes which connect the cars, to respond under certain conditions. These conditions are brought about by reason of rough treatment while cars are shunted, and from the character of the material of which they are made, suffer a gradual decay, which necessitates occasional renewal of parts. Otherwise they show a decided inclination to give out, and when in really a bad condition, the train is suddenly brought to a full stop, or being at the station the whole power of the locomotive is unable to move it, until the air is discharged from the reservoirs. Recently an improvement has been added in the shape of a double hose-pipe, so arranged that if one branch gives way it will be automatically closed and the remaining one will be called upon to perform its proper function. But it is reasonably doubtful if it will always do this quickly.

In the new electrical brake no such expense or complication will be necessitated, though there will be two checks at all times in the perfect working of the brakes. When the

main electrical conductor is charged, the pressure on the brakes is the same in each of the two mechanisms, but if at any time one of the two should give way, its power would be transferred to the other in at least twenty places by electrical shunts and switches and the result would be, that the brakes would be worked with a greater power and a greater certainty than ever before. This, then, is the principle, and a careful study of this theory on which the whole system is based, cannot fail to convince the most skeptical, that electricity is peculiarly adapted to the working of automatic brakes, and also that the inventor has hit upon the most correct idea of what constitutes a really efficient and effective brake.

We have shown in these columns, how the vacuum brake failed at Penistone and many other brakes are like it in this respect of uncertainty. They work along all right until, a dreadful calamity stares the engineer in the face, he then puts on the brakes with full force, and they refuse to respond. In other words, when they are most needed are the times when they are most unreliable, whereas this electrical brake is strongest and most certain when anything gives way.—*Railway News.*

Indicating Charge of Accumulators.

London *Engineering* says that the application of accumulators to store electric energy, or to regulate electric lamps, would be facilitated if it were known what quantity of energy were held in reserve at any epoch of their working. Hence, MM. A. Crova and P. Garbe have devised a method of automatically registering this quantity. Assuming that the chemical reactions which are produced on two plates of the accumulator are limited during charge to the transformation of the layer of sulphate of lead on the positive plate into bioxide of lead, and that of the negative plate into metallic lead, the charge which corresponds to the decomposition of one equivalent of sulphate of lead on each plate will transform—1. At the positive pole $Pb\ O_1\ SO^1_3$ into $Pb\ O_2$ liberating one equivalent of $SO_3\ HO$. 2. At the negative pole $Pb\ O\ SO_3$ into Pb_1 liberating one equivalent of $SO_3\ HO$. The electro-chemical equivalent of lead being 1.0867 milligrammes, and that of acid 0.51445 milligrammes, we see that each coulomb stored will act for each plate upon 1.0867 milligrammes of lead, setting free 1.0289 milligrammes of acid. In reality, these chemical actions produced in accumulators are not quite so simple, and MM. Crova and Garbe have observed phenomena which call for further study. Nevertheless, the above theory serves as a guide for the determination of charge proposed by these observers. The accumulators employed were those of Plante, as modified by Faure, and of the 40 ampere hour type. The weight of active matter was 3 kilogrammes, and they were charged with 1 liter of acidulated water containing one volume of sulphuric acid. The solution, therefore, contained 184 grammes of sulphuric acid, which, if entirely combined, would require 388 grammes of lead. Assuming that the accumulator could receive 40 ampere hours, or 144,000 coulombs, such a charge corresponds to the reduction of 155.8 grammes of lead on one of the plates and the conversion into bioxide of an equal weight of lead from the sulphate of the other plate. The quantity of sulphuric acid thus set free would, therefore, be 149.25 grammes, or 3.73 grammes per ampere hour. For a charge of 40 ampere hours the diminution of weight of plates and increase of weight of liquid would be respectively about 150 grammes. This motive force, proportional to the charge, is quite sufficient to indicate its variations, and even to register them. MM. Crova and Garbe have arrived at these considerations by the following means: An accumulator of 40 ampere hours. Initial intensity of charging current, 5.6 amperes. Initial density of acid, 1.04 at 15°. Quantity of sulphuric acid contained in the accumulator, 62 grammes. The charge had been prolonged twenty-four hours; the intensity of current diminished at first slowly. At the end of six hours it was 5 amperes; a very light disengagement of gas took place at the plates. The density was 1.10, corresponding to 108 grammes of acid. At the end of twenty-four hours of charge the density was 1.145, with 200 grammes of acid in the liquid. The variation of weight in the liquid was, therefore, 138 grammes; that is to say, near enough to the weight calculated. In noting from hour to hour the density of the acid and the intensity in amperes, one can prepare a table which will serve for a given accumulator to give the charge from the density. From the data for a single cell the charge of a whole battery can be found. The densimeter of Rousseau is convenient for this purpose. The variations of density in the liquid can also be used to construct an indicator of the charge. This has been effected by MM. Crova and Garbe by piercing a hole in the bottom of a cell and fitting a **U** tube to it, which terminates at its upper part in a large reservoir filled with a liquid (for example, benzoic ether, density 1.05 at 15° Cent.) non-mixable with the dilute acid, and of density nearly the same. The surface of separation between the two liquids serves as an index. Moreover, if the liquid be made to actuate a manometric capsule closed by an elastic membrane working a lever, the charge can be indicated by a needle on a dial. Lastly, MM. Crova and Garbe employ the weight of the plates to work the needle of an indicator by suspending them in the liquid from the arm of a balance and counterweight, which actuates the index. This method can also be employed to draw a diagram of the charge on traveling paper, the pencil making a mark every ten minutes or so by means of an electro-magnet and electric clock.

Electric Currents Produced by Rheostatic Machines.

By Gaston Plante.

The flow of electricity obtained by means of the rheostatic machine, discharged in quantity, presents peculiar features, and permits of the production of effects which cannot be obtained either with voltaic electricity or with the ordinary apparatus of static electricity.

These effects are at once mechanical and thermic, but the mechanical action is much more important than the thermic action. I have previously mentioned the nodes of vibration formed in a fine platinum wire ($\frac{1}{10}$ millimeter) traversed by this current, and which appear at almost regular intervals, presenting themselves in the form of acute angles with junctions connecting. The distance between these folded parts of the wire varies with the electromotive force of the current; if the wire is shortened it distorts itself completely, twists and untwists upon itself in all directions, and at last breaks spontaneously, though not strained.

If we cause this current to act upon a thin condenser of sheet mica, which may be perforated on account of the high tension which comes into play, the phenomena differ entirely from those manifested when a secondary battery of 800 couples acts alone upon such a condenser. There is here no longer produced a wandering electric spark, nor a globule of fire from the melted tin and mica of the condenser. We have a continuous series of brilliant sparks at the same point, and the mica, instead of being melted, is reduced to small lamellary fragments and projected around the condenser, forming a small artificial hail of micaceous spangles. Thus the effect manifested is especially mechanical, instead of thermic, and we have a fresh instance of the variety of phenomena which electricity may produce according to the nature of the source whence it emanates.

If we introduce a platinum wire in connection with one of the poles of the rheostatic quantity machine into a capillary tube open at its two extremities, and if we immerse one of these extremities into a vessel of salt of water, the other pole of the machine being in connection with the liquid, sparks attended by a peculiar harsh sound appear at the extremity of the tube. To each spark there corresponds an abrupt leap of the liquid in the tube, and as these sparks follow each other with an extreme rapidity, the liquid, not having time to re-descend, is raised incessantly by jerks to a height of 0.15 to 0.20 meter, according to the electromotive force of the current. We have thus a real image of the effects of the hydraulic ram, produced by a mechanical action due to electricity. Among the numerous analogies which exist between the phenomena produced by electric currents of high tension and the effects produced by mechanical actions properly so called, this is assuredly one of the most striking.

This experiment enables us to explain a very singular natural phenomenon manifested during a violent storm, accompanied by rain and hail, on July 30th, 1884, at Ribnitz, in Mecklenburg-Schwerin, and which, being as far as is known without precedent, has appeared totally inexplicable. The lightning having fallen upon a dwelling house, one of the panes of a window of a room on the first floor was pierced by a starry hole, and at the moment of the appearance of the lightning there was perceived the sudden irruption of a great quantity of water which seemed to come from the surface of the soil, and which rose like a fountain to the ceiling and inundated all the room. This fact, which was observed by several witnesses, may be considered as absolutely beyond doubt. It seems to us to be explained by a mechanical effect of electricity quite analogous to that which takes place in our experiment.

What may be the cause of these effects of aspiration produced by electricity when it is derived from a source combining quantity and tension? We may suppose that under these conditions there are produced phenomena of reaction and of deportation, comparable to those produced with currents of gases or vapors under high pressures. When each individual spark, endowed with a great mechanical power bursts in the capillary tube, at the same time that there is compression in one direction there is rarefaction in its neighborhood, and the motility of the medium in which the phenomenon is produced causes the liquid to rush into the vacuum formed, and may thus effect a well-marked ascending movement.

As for the peculiar features of the current of electricity, approximating at once to those of voltaic and of statical electricity, which produces these phenomena, they may be ascribed to the origin of this current, and especially to the medium which separates the electrodes or armatures. Here this medium is not, as in the battery, a liquid electrolyte, but a decidedly elastic and insulating matter, such as mica. Nevertheless it is traversed or thrown into vibration by the action of a current of high tension; for there is produced a charge-spark with these condensers, as if the armatures had between them a slightly conducting connection. When the condensers are discharged the plate of mica is likewise traversed like the electrolyte of a battery, and to the sudden recomposition which is then produced in this elastic plate there corresponds, in the circuit outside the condensers, a mechanical effect equally abrupt and instantaneous. Hence, if this effect is repeated consecutively a great many times we have a current *sui generis*, which may produce peculiar phenomena such as those just described.—*Comptes Rendus.*

What the States Pay.

The internal revenue receipts of last year were $121,000,000; this year they will probably be about $110,000,000, distributed about as follows: Alabama, $35,000; Arizona, $2,750; Arkansas, $90,000; California, $3,300,000; Colorado, $200,000; Connecticut, $425,000; Dakota, $10,000; Delaware, $200,000; Florida, $173,000; Georgia, $375,000; Idaho, $2,500; Illinois, $25,000,000; Indiana, $5,600,000; Iowa, $2,750,000; Kansas, $167,000; Kentucky, $15 000,000; Louisiana, $560,000; Maine, $50,000; Maryland, $3,150,000; Massachusetts, $2,400,000; Michigan, $1,500,000; Minnesota, $500,000; Mississippi, $50,000; Missouri, $6,500,000; Montana, $125,000; Nebraska, $1,500,000; Nevada, $5,000; New Hampshire, $375,000; New Jersey, $3,475,000; New Mexico, $70,000; New York, $13,500,000; North Carolina, $1,600,000; Ohio, $13,500,000; Oregon, $125,000; Pennsylvania, $7,500,000; Rhode Island, $130,000; South Carolina, $93,000; Tennessee, $1,250,000; Texas, $225,000; Utah, $4,500; Vermont, $30,000; Virginia, $3,000,000; Washington, $7,000; West Virginia, $550,000; Wisconsin, $3,000,000; Wyoming, $1,500.

Post Office Inspector Baird Wants $10,000 Damages from the Western Union.

United States Post Office Inspector W. C. Baird, of Chattanooga, Tenn., has begun suit for $10,000 damages against the Western Union Telegraph Company. The suit is instituted on account of a serious blunder committed at the office in Chattanooga on the night of April 26 in transmitting dispatches sent to the leading journals of the United States, in giving details of a gigantic counterfeit swindle exposed by Mr. Baird, at Langston, Ala.

Two men named W. W. and J. B. Fondren were arrested by Mr. Baird, charged with swindling. Their scheme consisted of issuing broadcast throughout the country letters offering to sell good counterfeit money, struck off on steel plates, at one cent on the dollar. They received hundreds of letters inclosing various amounts, and the sharp swindlers pocketed the contents, and of course did not reply to the communications.

Mr. Baird worked on the case several months, and after shrewd detective work succeeded in discovering the culprits, and they are now in jail at Huntsville.

On the night the swindle was exposed, telegrams were sent from Chattanooga to the leading newspapers in the United States, giving the details. The telegrams were worded in this way: "A gigantic swindle was exposed to-day by United States Post Office Inspector Baird. W. W. and J. B. Fondren, of Langston, Ala., have been engaged for months, etc." In transmitting the dispatch it was sent out as follows: "A gigantic swindle was exposed to-day. United States Post Office Inspector Baird, W. W. and J. B. Fondren, of Langston, Ala., have been engaged for some months, etc." The dispatch was published in the leading dailies with heavy head lines, announcing that a United States Post Office Inspector had been detected in a gigantic swindle.

Report of a Special Committee of the Common Council of the City of Fond du Lac, Wisconsin.

A committee of Aldermen from Fond du Lac, Wis., was recently appointed to go to Aurora and investigate the light, and perhaps their report of its working would be as fair and impartial as anything we could say. The committee say:

"Your committee spent Friday evening in walking about the streets, trying to find in the remote suburbs a place where the light did not cast a shadow. Such a place was not found. The city was traversed in various directions, and the light was found to be sufficient everywhere to be a substantial aid to the pedestrian. The light within the immediate vicinity of a tower (say within a block in any direction) is extremely brilliant; as one recedes from the tower the intensity of the light decreases in a direct ratio to the square of the distance. At a distance of half a mile from the tower it is still sufficient to see time on the face of an ordinary watch. It casts a distinct shadow at that distance, and so modifies darkness as to make traveling practicable and safe. It was observed that an obstruction to the direct rays from a building or a tree to any intervening substance, caused what appeared to be a black shadow; and yet when the dark spot was penetrated it seemed to be not that shadow, but the next one that was black. Always a dark spot ahead, but it could never be reached. Many an alley and by-place was approached where darkness seemed to reign supreme, but upon traversing the place the gloom would disappear, and light, though modified, perhaps, by surrounding obstructions, would be sufficient to answer every purpose. The shadows were more distinct and well defined where light only came from one tower. Counteracting rays from another direction practically destroyed the shadows."

The Grenet and Fuller Mercury Bichromate Batteries.

We illustrate on this page three forms of battery manufactured by the well-known house of J. H Bunnell & Co. The Fuller mercury bichromate battery, Fig. 1, is a most excellent one for any or all of the uses to which *strong* carbon batteries are adapted. Having all the powerful qualities of any of the various forms of carbon-electropoion batteries, its two great advantages consist in its being self-amalgamating from the supply of mercury in the porous cell, and in the great amount of sulphuric acid and bichromate (electropoion) capable of being held in the outside jar, thus giving much longer action than can be sustained in other acid batteries. At the same time its quantitative effects may be very greatly increased by doubling or trebling the carbon surface, in other words, using two or three carbons instead of one. By this change the Fuller battery is made to be one of the very best and cheapest forms of electro-plating battery that it is possible to construct. As this battery is capable of remaining on open circuit for weeks at a time without much deterioration, and without any attention, it is well adapted for ringing very large electric bells, or for any use where a specially powerful open circuit battery is required. This form is also well adapted for a laboratory test battery, and for all general experimenting.

This battery is strongly endorsed by Prof. Farmer and other leading electricians, as one of the strongest and most durable batteries ever introduced, and is unsurpassed for the purposes for which it is specially designed.

The very frequent inquiry for batteries which are sealed, to prevent spilling or evaporation, has induced Bunnell & Co. to put together the Fuller battery in the above shape, Fig. 2. A hard rubber top, having under it a sheet of gum packing, is clamped tightly to the jar by means of a screw shell of sheet metal made to engage the threaded top of the glass jar and clamp down the rubber cover in its place. Into the hard rubber top is inserted the porous cup, into the mouth of which is placed a rubber cork carrying a zinc. The carbon plate adjoining the porous cup is also permanently fastened to the hard rubber top. In this way the complete element is in a very practical shape, readily taken apart to clean or fill, and equally readily sealed tightly and safely.

Figure 3 illustrates the new American form of the Grenet battery. The large cut represents a cell of improved form of Grenet battery. It consists essentially of two carbons, with a zinc plate between them. It is similar in construction to the French pattern, and will produce as strong a current as the 10-inch cell of that make, while its cost is less. When the battery is not in use the zinc is saved by being raised from the liquid. The battery may remain in this condition for a long time without attention, and may be placed in service at any moment by depressing the brass rod which carries the zinc.

A Boston Contemporary's View of the Bell Telephone Company's Status.

BOSTON, June 15, 1885.

To the Financial Editor of the Transcript:

Will you allow an investor to make some inquiries through the columns of your valued paper as regards the Bell Telephone Company? As you have ever shown a disposition to treat the interests of the stockholders fairly, without regard for the strength of the corporation, your opinion will be entitled to more weight.

1. Has the position of the Bell Telephone Company ever been stronger than it is to-day?

2. Do the present or prospective suits against the company involve any questions except those already tried in other courts, and decided in their favor?

3. Has not the action of the Massachusetts Legislature proved the inviolability of their patent rights? Will not such action protect them in other States?

4. Is it reasonable to suppose that, having been denied the desired increase in capital, all effort is to cease upon the extension of their system until that is granted them?

5. Has there ever been a company's affairs so thoroughly ventilated with so little result derogatory to their character?

6. Are there not more facts obtainable to-day in regard to the Bell Telephone Company's affairs than can be had of the majority of securities sold in the open market?

7. Do you regard the stock as a conservative investment for one who desires and needs a return of six per cent. on his money?

H.

In reply to the above, we would say that the position of the Bell Telephone Company, barring the present business depression of the country, has apparently never been

FIG. 3.—THE GRENET BATTERY (AMERICAN FORM).

FIG. 2—THE FULLER MERCURY-BICHROMATE BATTERY.

stronger. There is no suit involving the validity of telephone patents, concerning which the Bell Telephone Company has occasion to feel the slightest concern. Decisions will be rendered in a few days, closing out a few petty cases, like the Molecular, and the Bell Company feels amply able to meet the Drawbaugh case, which will come up before long on appeal to the Supreme Court. There are no new suits so far as we can learn, and no new principles involved in the suits now in progress. The action of the Massachusetts Legislature has not proved the inviolability of the Bell patents, and the legislative or legal action in Massachusetts is no protection to the Bell Company's interests in less civilized communities where the administration of justice is imperfect, and where legislatures are not controlled by motives of equity and right. While the Bell Telephone Company has been fighting illegitimate opposition in the East, it has not, for instance, attempted to close out some opposition down in Texas.

In regard to the fourth question, we would say that we think that the Bell Telephone Company did right in refusing to pay even $2,000 for the passage of its charter-extension bill through the Legislature; we also believe that the defeat of the measure was a good thing for the company. The sale of Bell Telephone stock, upon which $15 per annum is now paid in dividends, to build interstate telephone lines would have injected an uncertain element into the value of Bell Telephone shares. Now we look for the organization of a new corporation to perform this use, rights to subscribe in which may be offered Bell Telephone stockholders. This would allow all who wished it to venture in the new enterprise, which would pay better, we believe, upon the basis of a new company, than under the Bell company. The fifth and sixth questions are argumentative interrogatories. We are not aware of anything derogatory to the character of the Bell company's affairs ever having been uncovered. There is a vast amount of talk, *ad captandum vulgis*, concerning the wickedness of stock watering. We do not see that it makes any difference whether Calumet & Hecla shares have a par value of $25 nominal and $15 actual under the corporate laws of the State, as is the fact, though they sell for $175, or have a nominal par value of $100 per share, or whether John Jones places a valuation of $20,000 upon his farm when he can only find a market for it at $10,000, but the exact truth in relation to corporate affairs should always be obtainable for the protection of all stockholders alike, and for the protection of the company against unintelligent public opinion and action. And it is agreeable to note that a certain valuation in estimating the character of a stock is placed upon the publicity given to its affairs.

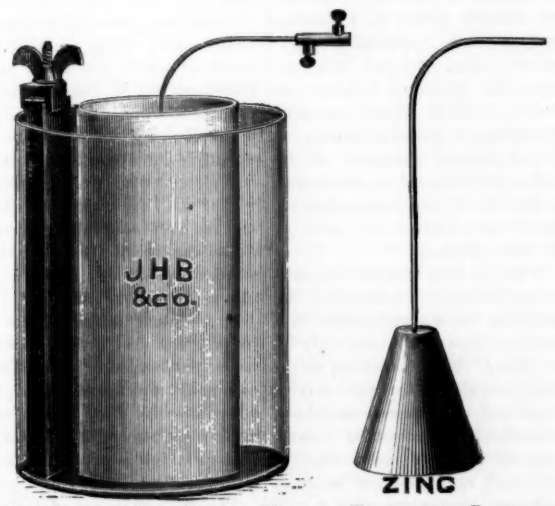


FIG. 1.—THE NEW FULLER MERCURY-BICHROMATE BATTERY.

To the last question we would carefully answer that the amount of the return upon an investment generally measures the risk. Bell Telephone at above 200 is a conservative investment for the rich, and not for those who actually need six per cent. Not to be misunderstood, however, we would say that we look for an advance in Bell shares under existing conditions, to 225 and above, but the stock is stock, and not a bond, and only the future of the telephone business guarantees its dividends. It is now loaning at about 18 per cent. (according to the company's figures, but we can calculate it higher), paying 3 per cent. quarterly and some extras and "rights." A 3 per cent. extra was paid last January, and some look for another 3 per cent. extra about next August.

Since writing the above, word comes from New York to-day that Judge Wallace has decided the Molecular Telephone an infringement upon the Bell patent. This was the Bell suit against the parent company, and the decision is upon the final hearing.—*Boston Transcript.*

An Alarm Candle Balance for Photometers.

An ingenious automatic method for signifying the rate of consumption of candles used in photometrical work has, says the *Journal of Gas Lighting*, been devised by Dr. Hugo Kruss, of Hamburg, for the gas examiners of St. Petersburg, and has been recently described and illustrated in the *Journal fur Gasbeleuchtung*. The arrangement is very simple. The candle-holder is hung in an unequal arm balance, as in the Sugg-Letheby photometer, in the position required for making an observation. The beam of the balance has a long pointer hanging down from the fulcrum, which marks the position of the balance on a vernier scale at the foot of the pillar. There are, as usual, two metallic pins at the two opposite ends of this scale, and in the middle a movable pin which is in electrical connection with a battery and a bell. Directly the pointer comes into contact with this pin, the circuit is completed and the bell rings. The method of using the balance is readily understood. The candles being lighted and fixed in position are weighed until the pointer just swings clear of one stud of the vernier, when any desired weight may be placed in the pan provided for the purpose underneath the candles, the clock being started at the same moment. Observations may then be taken while the candle burns; and the instant the weight placed in the pan is lifted by the consumption of the candles and the weight in the opposite pan, the pointer swings back and touches the pin, which completes the circuit and so rings the bell. This, of course, indicates, in conjunction with a glance at the clock, the precise rate of consumption of the candles, without touching or in any way interfering with them. The arrangement is a very neat one, the battery, electro-magnet, and bell being mounted on the balance stand, and all contacts being so placed as to be readily removed out of the way when not required. For this a special form of cell is used, with an arrangement for preventing waste when not required for the purpose specified.

* * A remarkable assertion is made in regard to the lightning rod of the Washington Monument. It is said that electrical tests with a galvanometer discover a resistance of two ohms. This indicates clearly a very imperfect ground connection and shows that the present apparatus cannot perform the work expected of it. The inability to discharge a heavy stroke of lightning into the ground instantly is obvious under the circumstances, and offers an explanation of why a stone near the rod was instantly shattered. The only wonder is that more damage has not been done. The aluminum tip is reported to be all blackened and battered with lightning already. The placing of a lump of metal on top of a slender rod is said to be a mistake and another element of danger. It takes such a charge of electricity that the rod connection below is not sufficient to carry all away, and there must consequently be more or less discharge in other directions. In reference to the imperfect ground connection, which is the most important point of all, it is supposed that the concrete foundation into which the lightning rod is sunk explains the resistance shown by the galvanometer. Although it is understood that the rod goes through the foundation and buries itself in the wet earth below, more perfect arrangements could, it is believed, be made. The scientists lately called upon to make a report on this subject have, it is understood, recommended additional tips on metallic prongs about the top of the monument, and these contrivances have been ordered. Electricians say that this will only increase the danger. All these criticisms may be but theories, but they come from a source entitled to consideration.

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We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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NEW YORK, JULY 4, 1885.

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The bakers of London are happy over a new method of observing the progress of baking. Ovens have been provided with plate-glass doors and lighted with electricity, and by this means all stages of the baking can be easily noted.

The Lehigh Valley Railroad has commenced a series of exhaustive tests with the electric headlight of the American Electric Headlight Company, of Akron, Ohio. This light has given satisfaction in former trials, and if as successful on this occasion will, no doubt, be adopted by railroads quite extensively.

And now it is announced that Bonanza Mackay and Geo. S. Roberts, the mining adventurer, are getting ready to unload the Postal Telegraph upon the Western Union Co., thus making another in the long list which have been absorbed by this company. The *Real Estate Record* announces that Mr. Garrett is also willing to sell out the Baltimore & Ohio Telegraph Company if the Western Union will purchase.

The Central Union Telephone Company announces a quarterly dividend of $1.50 per share, from net earnings, payable July 25 to stockholders of record July 18. This is the sixth dividend paid by the Central Union. Western telephone companies are doing better this year, and several others will probably resume the payment of dividends by Jan. 1. Among these the Missouri and Kansas Company, which is reported as earning 6 per cent. on its entire capital at the present time, but is paying off some old accounts with these earnings.

The Bankers and Merchants' Telegraph Company announce through Dwight Townsend, chairman of the committee, the following reorganization scheme: "The General Mortgage Bondholders are notified that their bonds must be deposited with the Farmers' Loan and Trust Company, under the reorganization agreement, on or before the 3d day of July, 1885. Such company will give a certificate of deposit. The successor company has been organized under the laws of the State of New York, to be known as the United Lines Telegraph Company, and such company is pledged to carry out the re organization agreement."

AN ENGLISH COMMISSION LOOK AT THE PARIS SEWERAGE SYSTEM.

The English Commission that visited Paris some time since to study the manner in vogue in that city of leading the telegraph and telephone wires through the sewers, has finished its labors, and its chairman, Mr. Haywood, a skillful engineer, has made the following report, which we translate from our French contemporary *Bulletin Internationale des Telephones:*

"The members of the commission on sewers have studied with no little curiosity and astonishment the sewers of Paris, and have gathered many interesting facts concerning these constructions as a result of their subterranean voyaging.

"The London system of sewers forbids such an arrangement of telegraph and telephone wires, because even through the largest a man can pass only with difficulty. The wires would obstruct the sewers, and it would be impossible to keep either the sewers or the wires in repair under any such arrangement.

"In order to adopt the Paris system of sewers, it would be necessary to tear up the London streets and build great conduits many miles in extent, and the cost would not be less than 800,000 francs a kilometer [$160,000 for 1,093 yards]. Oxford street is eleven kilometers long, and yet it by no means traverses the whole of London. It is therefore for us to decide whether we will expend these millions in building sewers, or leave the skies of London obscured. If the wires continue to be increased in the future as they have been in the recent past, the day is not far distant when London will seem to be held captive in a great net."

From this it will be seen that the commission do not even take into consideration the project of bunching the wires altogether into a coil and burying them surrounded only by lead or iron tubing. The reasons for this is that experiment has shown that good service cannot be rendered under these conditions, and as good service is of paramount importance, this plan was long ago abandoned.

If the Londoners only had our Board of Aldermen and State Legislature, they would come to look at this matter in a far different light. They have yet to learn that retardation and induction may be got rid of by Aldermanic resolutions and legislatine ukase—and "boodle."

The English, being a slow people, wedded to old-time views, are under the impression that only electricians and engineers are capable of deciding such questions as whether or not telephone and telegraph wires will work efficiently underground. But this is a grave error. The proper persons to decide these questions are gin-mill proprietors, farmers and mule-drivers. We know this because we have recently seen them decide similar questions for New York City and Brooklyn.

RECENT PROGRESS IN PRIMARY BATTERIES.

During the past two or three years there seems to have been a revival in invention of new types of primary batteries, and also in the modifications of the older ones, and this circumstance is, no doubt, due to the reaction which we should naturally expect to follow the extremely rapid introduction of the dynamo into practical use.

At the outset it looked as if there would shortly be no further need for the galvanic battery; it was the popular opinion that with the aid of the secondary battery it was to be completely displaced. Thus inventors turned their energies in other directions. But this view has changed. The secondary battery failed to carry out the part assigned it, and there still remains a very wide field for the primary battery in electrical art, which fact is being recognized more and more every day.

To invent a successful battery requires at the outset the combined skill of the chemist and electrician, and after these—original and extended experiment and untiring patience.

The number of chemical reactions that will give a current of electricity is very very large, but to so select the materials that the least quantity of energy shall be wasted in heating the cell itself—that the by-products shall be of commercial value, or that the original materials shall be cheap—these are a few of the points which must be made to harmonize with the development of great energy in the external circuit and great constancy of current with an absolute lack of wasting action in the cell on open circuit.

It has become so common as to be remarked that when a new element is announced the broadest claims are set up for it, based in most instances, upon the most crude examinations, or perhaps upon the most superficial laboratory tests. In many cases, unfortunately, when it is placed in actual every-day use it belies these claims and often proves unworthy to rank even with the poorest of our older cells. The inventor loses not only time and money, but assumes the disagreeable consequences of a public failure which he might have avoided by first ascertaining, not that his cell would give a current simply, but that it would give it economically and in an available condition. As to the battery, which is thrown together for a stock jobbing purpose, it is sufficient to say that though the fools are not all dead yet, the millennium in that line has past.

There have been at different times many modifications of the Callaud cell, the more recent of which are those of Mr. Serson Kaufmann and M. Doumoulin-Froment—the first was described in detail in a recent issue of the REVIEW, and consists essentially in placing in the upper part of the cell a porous vase pierced with several holes and surrounding the zinc, the object of which is to prevent the *black mud* falling upon the copper—a disadvantage of this cell is that the copper solution cannot so easily circulate about the zinc as in the old element.

M. Froment places at the bottom of the jar a glass vase or jar, closed on top, the lower portion being pierced with holes, this vase holds the crystals of sulphate of copper which dissolve more or less rapidly according to the strength of the liquid. This same principle is applied in the Watson battery, invented in this country in 1876.

The great objection to the Bunsen element, as is well known, is the noxious fumes which it gives off, and numerous endeavors have been made to so modify the cell as to do away with these fumes, and at the same time retain its strong current and great constancy.

M. H. Thame, instead of using pure nitric acid, employs a mixture of three parts of that acid with one part of chloride of chromyl ($CrO^2\ Cl^2$). This mixture reduces, it is said, the polarization to a minimum, but the evaporation of the gases is not completely suppressed, for it develops after a while fumes of chlorine instead of nitrous fumes. The Lacombe cell for electric lighting is a modification of the Bunsen. The carbon is immersed in a liquid composed of the sesquioxide of iron and chlorate of potassa. The depolarizing action is expressed by the following formula:

$$3(Fe^2O^3,3SO^3)+3H=6(FeO,SO^3)+3SO^3+3HO$$

At the same time the sulphuric acid acts upon the chlorate of potassa and decomposes it, the chlorine, which is set free, combines with the hydrogen thus:

$$6(FeO,SO^3)+3SO^3+3Cl=3HO(3Fe^2O^3,3SO^3)+3HCl$$

With this cell the expense of production of a horse-power of energy is high, from about $1.35 to $1.55 per hour.

In the element of Messrs. Buchin, Trieoche & Co., the hydrogen, in place of being carried off by a depolarizing substance, is prevented from attaching itself to the carbon by a special composition, a secret of the inventors.

According to them, this pile will never polarize, it occupies but a small space, and is cheap. Its electromotive force is 1.15 volts., but the internal resistance is considerable, which renders it inapplicable in some cases. Seuet's cell consists of a rectangular wooden box containing two carbon plates forming the negative electrode, these are immersed in a solution of double sulphate of ammonia and sesquioxide of iron. The zinc is amalgamated and separated from the depolarizing liquid by a porous vase. A quart of this liquid costs only about 10 cts. The electromotive force is 1.7 volt.

The cell of Messrs. Holmes & Burke has caused favorable comment in England, but its composition is not known in detail. The electrodes are of zinc and carbon, and the exciting fluid has received the name of *oxydone*. It has been stated quite confidently that it is composed of nitrate of soda and sulphuric acid.

According to the inventors, the liquid costs but 12 cents for 9 elements capable of maintaining 6 lamps of 7 candle-power for 12 hours. The zinc consumed will cost but ½ a cent per hour per lamp of 10 candle-power. The elements are quite large, 15 occupying a box 53 inches long by 12 inches wide, by 10 inches high. The electromotive force is 1.8 volts per element, and the internal resistance 0.02 ohm. In the cell invented by M. Geo. Pierre a solution of commercial caustic potash is used as the exciting fluid. Unamalgamated zinc forms the positive electrode, and iron, taking the form of a box, the negative. On the face of the box towards the zinc are a number of fine points. Its constancy is high, though its electromotive force is not large. When the circuit is open the zinc is not attacked if the zinc is properly arranged and the element hermetically sealed.

Another new pile is that invented by M. Grezel. The electrodes are rods of electric light carbon. The positive carbon is surrounded by a parchmentized paper cylinder which contains binoxide of copper, the negative carbon is immersed in a solution of hydrochloric acid well concentrated.

After a series of experiments the inventor obtained the best results by surrounding the positive carbon with slacked lime placed in a porous vase. The chemical action is expressed as follows:

$$HCl+CaO,HO=Ca\ Cl+2HO.$$

The Skrivanow element was described in the REVIEW of the 21st of February, 1884. The internal resistance of this cell is very high, so that according to the statement of M. Rothen, in the *Journal Telegraphique*, with an electromotive force of 1.45 to 1.50 volt, a current of one ampere for but one hour is obtained. To renew the exhausted cell it is necessary to first change the liquid and after two or three renewals it is necessary to replace the chloride of silver. This cell seems to have been very much overrated.

M. Pabst has invented a pile in which he employs wrought iron in a solution of chloride of iron instead of zinc. Its electromotive force does not exceed 0.78 volt, and it is reputed impolarizable.

The pile of Messrs. Bartoli & Papasogli consists of a positive electrode of platinum and a negative of a mixture of graphite and retort carbon. The liquid contains hyper

chlorite of soda. The electromotive force is 0.2 volt. The cells of Jablochkoff, Riatti, Tommasi & Radiquet and Haudmann are not examined, as they are fully described in previous issues of the REVIEW.

THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

At a meeting of the Executive Committee of the National Electric Light Association, held in New York on the 9th instant, it was resolved, that a general meeting of the National Electric Light Association be held at the Hotel Dam, Union Square, New York, at noon on the 18th day of August next, and to continue from day to day until such business as may be presented shall be properly disposed of; also resolved, that invitations be sent to all companies and persons eligible under the constitution, who are not already members, to become so at once.

To fully explain the qualifications necessary to become a member, either as associate or active, I beg to quote the following extracts from the constitution of the National Electric Light Association:

Article II.—Members of this Association shall be companies, firms or individuals operating electric light plants or manufacturing electric light apparatus.

Article VIII.—The entrance fee shall be ten dollars, and the annual dues shall be ten dollars for each member.

Under these provisions, you are cordially invited to join the association, and, should you accept, please notify the undersigned, enclosing your draft or check for ten dollars, payable to the order of Summerfield Baldwin, Esq., treasurer. By return mail you will receive a receipt, which will be your credentials, admitting you to the convention to be held in New York, August 18th, 1885.

You are requested to send to the undersigned a list of subjects which you wish to suggest for discussion at the convention.

Yours very truly,
J. F. MORRISON,
President National Electric Light Association.

GENERAL WESTERN NEWS.

Something in novel form for regulating an incandescent lamp—a sort of picking the wick up or down, is the invention of Mr. C. Wort, of the Western Edison Company here. It consists of a board, which is to be screwed to any convenient place on the wall or wainscoting of a room, or a table, upon which there is placed a resistance coil so divided as to connect different resistances through any one of five switch contacts, or cut it out entirely through a sixth. A convenient switch arm manipulates these, and so allows of diminished light for night lamps, sick rooms and the like. The outward appearance of the apparatus is that of a box of coarse wire cloth, the coil being inclosed in a box within, this measuring about 7x5 inches.

The invention arose from a demand for something of the sort, and it perfectly fills the bill. The present lot is to complete an order for hospital use.

As the energy which is thus taken from the lamp is converted into heat, it has been suggested that a novel application of this principle would be its utilization for warming cold feet or other portions of the body in bed. One-half of one candle power would thus give an equable, constant heat, and the apparatus could readily be formed in any convenient shape for the purpose, as for instance, immersed in a rubber water receptacle, or as a box or cushion. The attendant nurse would only have to place and regulate the heater, and the current would continue to furnish the requisite warmth while the dynamo ran.

In the upper portion of the Pullman building, a restaurant, with all that the word implies, is located. Nine stories from mother earth, a white capped and aproned divinity of the cuisine, runs a baker's oven, and within the oven burns an Edison incandescent lamp, which is probably the first application of this sort on record. There is but one drawback in practice. The light does its work, illuminating the gloom of the miniature furnace nicely, but if once the globe becomes smoked, the internal heat is prevented from radiating, and the glass succumbs to the heat. While the globe remains clear, the result is in every way satisfactory.

The latest—and the last, one would think—parties to enter into the electric light business are its sworn enemies, the manufacturers of illuminating gas. Yet a well authenticated case of this species of anomaly exists in a town a little way from Chicago. Whether the gas company has purchased the plant because of outside pressure among its friends, or perhaps to retain its hold as a monopoly of the light business, or like the clerk in the store of his brother-in-law, who sold goods cheap, to break up the concern, will probably never be known; but the fact remains—and hereafter when a customer wants light, he will be permitted to take "whichever you pleases, my little dear, you pays your money, and you has your choice."

The annual report of the Fire Marshal of Chicago, to December 31, 1884, has recently been issued, a few facts from which may be of general interest.

The removal from the old quarters, known to the public by the appropriate name of the "old rookery," to the present capacious and convenient headquarters in the new city building, was accomplished on the 23d of October last. During the first eight hours of the transfer there were five first, and one second alarms received at the old, transmitted to and sounded from the new office, without confusion or error.

The alarm station system includes, counting six in the stock yards, 520 points distributed throughout the corporation, whence alarms may be sent to the Central office by the general public, 434 public police boxes, which may be utilized for such purposes, and in addition, 332 private police boxes, a total of 1,286 stations whence an alarm of fire may be communicated to headquarters.

Of overhead fire alarm wire there are 358 miles of good quality, averaging 25 ohms resistance per mile.

All the wires leading into the new office are brought to the building through underground conduits, so that the former unsightly and inconvenient pole-line connections are happily got rid of.

The underground system comprises 7,931 feet of conduit, 4,872 feet of iron pipe, 5,760 feet of cable, 36½ miles of single wires, 23 man-hole chambers.

The old code of telegraph signals, which was limited, and worse by far than Morse, because the code was entirely of dots, has nearly died out—the telephone having displaced it. All sub-offices of the Department are directly or indirectly connected by telephone lines to the general center, and the convenient and efficient service rendered cannot be overestimated in a department of this size.

The Superintendent recommends the substitution of keyless doors of the new model, in place of existing doors on the street boxes. By this means the often valuable time lost in hunting up the key is utilized, and both labor and property loss economized in consequence.

Speaking of the moral effect of the electric lighting, Professor Barrett says, in his report to the Fire Marshal:

"A few words are perhaps admissible on the moral effect of electric lights, which it would seem is greatly in their favor. Before its rays the worst elements of society shrink and flee, to hide in less public localities. In neighborhoods where these lights are frequent and in considerable numbers, merchants have repeatedly spoken to me of the quiet, constant purifying influence exerted by the flood of light in localities where previously the fall of night had been the signal for the gathering of some of the worst classes of society of both sexes."

In the Department of Police, Telegraph and Patrol, the multifarious service performed by the wagons of the department, which, like the Fire Department, is run by electricity—the system, not the wagons—is seen to embrace a wide area of usefulness:

Reports received by telephone from policemen, 857,084; 23,921 alarms responded to; 14,592 arrests made, and 3,256 disturbances suppressed without arrests; 56,087 miles traveled; 365 bodies taken to the morgue or the residences of friends; 2,375 sick or injured persons taken to residences, hospitals or stations, to be cared for; 8,010 prisoners taken to police courts or county jail; 80 abandoned children treated to a ride to the Foundlings' home.

They have rescued many a poor fellow, sometimes against his will, from drowning, recovered stolen property, and lost children, and horses as well, picked up destitute children and turned them over to some asylum or home of the friendless; girls with a tendency to the bad have ridden in them to the House of the Good Shepherd or the Erring Woman's Refuge; and men and women inebriates have been carefully conveyed to the Washingtonian Home, in the one instance, or the Martha Washington Home in the other, besides numberless other excursions in the interest of law, order, society and morality.

The Police Telephone and Signal system is one of the grandest improvements of the age, and without it the city of Chicago would not now be content.

Some time since the County Commissioners advertised for bids for electrically lighting several of the county buildings of Cook county. At the regular meeting of the Board on the 22d instant, Commissioner Van Pelt read the report of the Committee on Charities, which urged immediate action in the premises, on the score of economy and safety, especially in the hospital, infirmary and insane asylum.

He said the county was now paying over $2,000 monthly for gas, and the cost of putting in electric plants would only be what this would amount to in about two and a half years, after which the running expense would be but nominal.

The estimate is for incandescent lights as follows:

County Building	$1,200
Criminal Court	350
County Hospital	1,300
County Infirmary	250
Asylum	320
" new wing	65
Total	$3,485

The U. S. Company's bid offers to place the above plants and furnish a man to run them for 30 days after completion and acceptance, for $79,800.

The next lowest bid was by the Western Edison Company, whose figures for the same estimate were $83,000, but it was awarded to the U. S. Co.

The question of crookedness in the State Legislature, previously alluded to, has come down to a matter of flat contradiction. Superintendent Tubbs' affidavit is as follows:

"Frederick H. Tubbs, being first duly sworn, states that he is District Superintendent of the Western Union Telegraph Company of Chicago, his district covering most of the States of Illinois and Iowa, and that during the early part of the present session of the Legislature Representative John H. Baker twice called at his room at the Leland Hotel, Springfield, Ill., and offered to take care of (kill) his own bill (House bill No. 178), and stated that he could in all probability do the same for any other bills prejudicial to the interests of the Western Union Telegraph Company.

"He particularly mentioned Linegar's bill [144], taking —— percentage on gross receipts. He asked as compensation $500 at the time, and probably 'two' at the close of the session. He afterwards explained that 'two' meant $2,000."

Representative Baker admits the interview referred to, and after the labors of the investigating committee were closed, rose to a question of privilege, and said:

"My honor and integrity, I believe, are being tried at the bar of this house. I waive my constitutional rights as a member, and stand here as a man before men."

He continued by saying that at a former session he introduced a bill taxing one of the most formidable corporations in the United States, and was not ashamed of it. He had done the same again this session. He admitted the fact of being interviewed by Supt. Tubbs, but denied the charge of corruption made by that gentleman. "If Mr. Tubbs has any friend who desires to defend him let him come forward. When he swore to that affidavit he uttered a malicious lie. He is a purjured villain, and his dirty, corrupt, and filthy soul is scorching in the fires of perjury to-night."

The matter now rests for the present on the personal veracity of the two gentlemen. Each denies, each defies the other, and as a climax, Mr. Baker said, he proposed the bill should pass. He concluded: "I now defy them, and say they are a horde of perjured villains." There the matter rested at the close of the session of the 24th,

> "And silence like a poultice came
> To soothe the wounds of sound,"

in the legislative hall.

A private detective at Mr. Tubbs' residence has been unable to learn of any purchases by that gentleman of burn remedies on account of the "fires of perjury" mentioned.

From Fort Worth, Texas, comes the startling intelligence of a "Great Discovery," by J. H. Brown, who has invented a telegraph and telephone without batteries, by which with a pair of instruments, "magneto transmitters and receivers," he both telegraphed and telephoned between Cleburne and Ft. Worth, a distance of thirty-eight miles, for two hours. The telegraphing was done by tapping the diaphragm. As is usual in all these tests the line was totally free from outside induction, and worked perfectly satisfactory.

By and by, when this sort of thing has brought the science down to a point when all of us can carry a set of telephones in our pockets and make our own connections, when experts shall have reduced the present complex affair to the simplicity of a stick and a string, when the cumbrous detail of operators, toll line and local switch-boards, leases longer than the moral law, quarterly payments, volts, amperes and ohms are done away with, how happy we all will be!

CHICAGO.

A German trade journal says a waterproof paper which will shine in the dark can be made of forty parts paper stock, ten parts phosphorescent powder, ten parts water, one part gelatine, and one part bichromate of potash. A powerful magnet with a covering of this luminous paper, moulded in the shape of a key-hole, would make the fortune of some one.

The B. & O. Telegraph Company has been temporarily enjoined from maintaining a public telegraph office in a certain hotel at Long Branch, the restraining order being granted the Western Union. The enjoined company is not to be so easily disposed of, however, and has opened an office on the lawn, under a gigantic sun umbrella, and announces reduced rates between Long Branch and all other prominent watering places.

The United Lines Telegraph Company—capital stock, $10,000—filed articles of incorporation the other day in the County Clerk's office. The par value of the shares is placed at $100. The company is to operate in the United States, Canada and Europe. The incorporators are John Anderson, Edwd. S. Stokes, Alfred Sully, Alexander H. De Haven, Dwight Townsend, Benjamin W. Allen, Horace Stokes, Henry A. Tappin and George Turnbull.

A decree was entered in the United States Circuit Court, Philadelphia, granting to the American Bell and the Pennsylvania Telephone companies a perpetual injunction restraining the Rogers Telegraph and Telephone Company, Robert Klotz and John Leukel, from the manufacture, use and sale of telephones containing improvements declared to be infringements upon Bell's patents. The court appointed Francis T. Chambers, master, to take testimony and assess the damages coming to the plaintiffs.

Telephonic News

*** Two or three of the large telephone exchanges of the West are reported as contemplating putting in the McDaniels-Barrett switchboard.

*** The Hudson River Telephone Company's "list of subscribers," just published, is a pamphlet of 108 pages. The Albany office is now connected with 138 cities and villages.

*** Knoxville, Tenn., is said to be the only city in the United States of 30,000 inhabitants, and having railroads, steamboats, telegraphs and telephones, that publishes no paper on Monday.

*** The net output of instruments by the American Bell Telephone Company for the month from May 21 to June 20, inclusive, was 2,411, against a net output of 4,568 for the corresponding month last year.

*** Mr. Gillett, of a long distance telephone fame, is at present in England, and will undertake a series of experiments on the Commercial cable some time during the summer. The instruments for the experiments are being manufactured.

*** The *Colonies and India* states that by a simple connection of the telegraph wire to the telephone instrument, in the news room at Port of Spain, it was found that communication with San Fernando, a distance of 45 miles by wire, could be carried on with as much ease and precision as between any two places in the city.

*** The declaration was made on Friday of a two per cent. extra cash dividend to the stockholders of the American Bell Telephone Company, payable with the regular quarterly dividend of three per cent., and making cash dividends at the rate of at least 17 per cent. for the year. Bell telephone stock advanced from 210 to 213.

*** An answer to the patent infringement suit of the Bell Telephone Company against the Western Pennsylvania Telephone Company, has been filed in the United States Circuit Court at Pittsburgh, Pa. The defendants deny the validity of the Bell patents, on the ground that the invention was known fifteen years before Bell or Edison took out patents by which control of the system is now claimed.

*** Judge Wallace has rendered a decision, in the United States Circuit Court, in the suit for infringement of patents by the American Bell Telephone Company against the Molecular Telephone Company. The case was argued on March 30 and April 2 last, by E. N. Dickerson for the plaintiff and Wheeler H. Peckham for the Molecular Company. The complainants claimed that the patent of Alexander Graham Bell, of March 7, 1876, was a fundamental one, covering the whole field of telephonic communication. Judge Wallace, in his opinion, carefully goes over the evidence in the case. He cites the opinion of Judges Lowell and Gray in suits for infringement in the Massachusetts Circuit Court by the Bell Company against Spencer and Dolbear, in which the same questions as in the present case came up. Those cases largely depended upon the apparatus of Reis, who, it was claimed, made a speaking telephone, though the inventor never supposed it to be capable of transmitting articulate speech. Judge Wallace, after stating that in 1854 Bonsend described Reis's apparatus of 1860, says: "It seems impossible to escape the conviction that had the speaking telephone been left where it was left by Reis and by those who endeavored to develop and perfect his theory, it would only have realized the speculations of Bonsend. The testimony introduced by the defendant only serves to confirm the opinion of Judge Lowell, 'that a century of Reis's would never have produced the speaking telephone.'" Judge Wallace orders a decree for the Bell Company.

*** A City of Mexico dispatch states that the Mexican Telephone Company has contracted to furnish the government twenty-five telephones, and that private subscribers are increasing.

*** The Long Telephone and Telegraph Company has been organized at Washington, D. C., the officers being Dr. Jas. A. Harlan, president; Charles W. Long, vice-president; Robert J. Thomas, secretary and treasurer. The company has purchased all right and title to the "Long transmitter," and now offers telephones for sale.

*** A game was played at Communipaw on Saturday last between the employes of the New Jersey and the Long Island Divisions of the New York and New Jersey Telephone Company, which resulted in a decisive victory for New Jersey, by a score of 38 to 10. A return game will be played in Brooklyn at an early date.

*** The Mayor, Comptroller and Commissioner of Public Works must appoint before July 5 three commissioners to carry out the provisions of the new law requiring the placing of telegraph and telephone wires underground. Among the candidates are S. W. Thompson, P. J. Casey, J. D. Crary, Walter C. Stokes, Thomas Keech, W. R. Stewart, Charles G. Curtis, W. H. Weed, B. G. Penneck.

*** It is stated that the Western Union Telegraph, Philadelphia Local Telegraph and Bell Telephone Companies have combined to give a practical test of underground wires. They have applied for permission to lay conduits on Chestnut street, from Twenty-second street to the Delaware and on Third street, from Walnut to Vine. General Manager Plush, of the Bell Telephone Company, says it is the intention of the three companies to use the conduits for experimental tests, and that the system will be given a fair trial, in order to show that the companies intend to make an honest effort to solve the problem of underground telegraphy, which has been so vigorously demanded.

The Underground Wire Commission.

We mentioned briefly last week that Mayor Low had appointed as commissioners of electrical subways, under chapter 499 of the Laws of 1885, Messrs. George W. Plympton, of 151 Macon Street; Rossiter W. Raymond, of 123 Henry Street, and John Reynolds, of 581 Carlton Avenue. Neither of these gentlemen is what may be termed an electrical expert, although Commissioner Plympton is Professor of Chemistry and Electricity at the Polytechnic Institute, and also instructor at Cooper Institute, New York. Mr. Raymond is a well-known resident of this city. He is with Cooper, Hewitt & Co., of New York, as a scientific expert. Mr. Reynolds is a lawyer. The Mayor selected him because he thought a lawyer on the commission would be of value in a great deal of their work, and in case it should become necessary to use coercion. Speaking of Professor Plympton and Mr. Raymond, the Mayor said they had an extensive acquaintance with scientific men, and large experience in such matters as would make them competent to decide intelligently between what was practicable and impracticable in any propositions that they might have to pass upon. They occupied positions which rendered them independent of electrical companies for their earnings.

As was stated the other day, the applicants for those three places were far more numerous than the applicants for any other three places Mr. Low has filled since he has been Mayor. He received no less than about fifty applications. Neither of the appointees, however, made application.

The law provides that the commission shall meet and organize as soon as practicable. They must give at least ten days' notice in a daily paper of the time and place of meeting. Their salaries are $3,000 each, and they serve until November, 1887, unless they shall complete their work meanwhile. The salaries and expenses of the commission will be paid by the companies using electrical wires, if they are found foolish enough to submit to such an unconstitutional and pernicious law. Is it not about time the electric light, telephone and telegraph companies had a conference for the purpose of devising method of united action in this matter?

In Favor of the American Bell.

The decision in full of Judge Wallace, in the case of the American Bell Telephone Company against the Molecular, is given below. It will be found of special interest, as it is the last of the important suits relating to these infringements:

UNITED STATES CIRCUIT COURT—SOUTHERN DISTRICT OF NEW YORK.

The American Bell Telephone Company et al vs. *the Molecular Telephone Company et al.*

WALLACE, J.

Infringement is alleged of the fifth claim of the patent granted to Alexander Graham Bell, No. 174,465, bearing date March 7, 1876, for improvements in telegraphy and of the fifth, sixth, seventh and eighth claims of the patent granted to Bell, No. 186,787, bearing date January 30, 1877, for improvements in electric telephony.

The fifth claim of the first patent is for "the method of and apparatus for transmitting vocal or other sounds telegraphically, as herein described, by causing electrical undulations similar in form to the vibrations of the air accompanying the said vocal or other sounds substantially as set forth." The scope of the invention thus claimed, and the construction which the claim should receive, were considered and decided in the cases of this complainant against Spencer and this complainant against Dolbear by the Circuit Court for the District of Massachusetts. In the Spencer case, it was held by Lowell, J., that Bell discovered a new art—"that of transmitting speech by electricity, and has a right to hold the broadest claim to it which can be permitted in any case; not to the abstract right of sending sound by telegraph, without any regard to means, but to all means and processes which he has both invented and claimed." It was also held that the essential elements of the method are the production of what the patent calls undulatory vibrations of electricity to correspond with those of the air, and transmitting them to a receiving instrument capable of echoing them, and that an apparatus in which the transmitter was made on the principle of the microphone was an infringement of the fifth claim of the patent.

In Dolbear's case, it was held by Gray, J., that the invention claimed is not merely the apparatus described, but also the general process or method by which the human voice produces in a current of electricity a succession of electrical disturbances—not sudden and intermittent, or pulsatory, but gradual, oscillatory, vibratory or undulatory, so as to give out at the further end of the conducting wire sounds exactly corresponding in loudness in pitch and in tone, character or quality, to the sounds committed to it at the nearer end. The defendants use a telephone apparatus consisting of a speaking microphone transmitter and a magneto-receiver. The defence upon which they principally rely is that their apparatus is substantially such as was made by Reis, of Germany, in 1860, and described in numerous publications before the date of Bell's invention, and they insist that if the fifth claim of the patent is not void for want of novelty, in view of its anticipation by Reis, its scope is restricted, and that the claim and method of Bell is confined to apparatus in which a magneto-transmitter is used; and upon this construction, as they use a microphone transmitter, they insist they do not infringe.

In the Spencer case the Reis instrument was relied upon to defeat the patent or limit the construction of the fifth claim. It was said of his apparatus in that case by Judge Lowell that "the regret of all its admirers was that articulate speech could not be sent and received by it. The deficiency was inherent in the principle of the machine. * * A century of Reis would never have produced a speaking telephone by mere improvement in construction." Unless the evidence so far as it relates to this branch of the defence materially distinguishes the case from the Spencer case the decision there should be controlling, and it would be unseemly when the parties can resort to an appellate tribunal for a review, to disregard the rule of comity which should prevail between courts of co-ordinate jurisdiction.

Additional testimony has been introduced by the defendant to show that the Reis apparatus is a speaking telephone although the inventor never supposed it to be capable of transmitting articulate speech, and although it has always been conceded by the most eminent authorities to be incapable of doing so until some of the experts in the present case have brought themselves to a different opinion. Reis himself undoubtedly believed that the transmitter in his apparatus acted by making and breaking the electric circuit, and it is conceded that an apparatus operating upon this principle is not capable of the transmission of musical sounds.

Bell's method consisted in employing an undulatory current of electricity in contradistinction to an intermittent or pulsatory one. He was not the first to employ the so-called undulatory current of electricity, but he was the first to utilize it for copying and transmitting air vibrations exactly corresponding in amplitude, rate and form to those produced by the human voice. His discovery was that these vibrations could be transmitted and copied by the use of such a current, and his invention consisted in devising suitable apparatus for producing the undulations upon a line wire and communicating the vibrations to this current at one end of the wire and reproducing them at the other end. It is essential that such apparatus should not operate to interrupt or break the electric current, but shall operate by means of a practically continuous electric current or circuit. Bell pointed out different ways of generating the undulatory current, as by a vibrating armature in front of an electric magnet, or by varying the resistance in the electric circuit, but these were not of the essence of his invention.

The microphone, according to Professor Hughes "introduces into an electric circuit an electrical resistance which varies in exact accord with sonorous vibrations so as to produce an undulatory current of electricity from a constant source, whose wave length, height and form is an exact representation of the sonorous waves."

As early as in 1854 Bourseul described essentially the apparatus made by Reis in 1861. He said: "Could there now be invented a metallic plate which should be so movable and pliable that it reproduces all the vibrations of tones like the air, and should this plate be so connected with an electric current that it should alternately make and break the electric current according to the air vibrations by which it is affected, it would thereby be possible also to arrange electrically a second similarly constructed metal plate so that it would repeat simultaneously exactly the same vibrations as the first plate, and it would then be exactly the same as if one had spoken in the immediate vicinity against this second plate, or the ear would be affected precisely as if it had received the tones directly through the first metallic wall."

Several modifications of the apparatus devised by Reis are described by Legat, Pisco, Vanderwyde and others, and all agree that the diaphragms of the transmitters were intended to operate so as to sever or break the electric circuit at each vibration when actuated by sound waves, and as constructed did operate in this way. The first transmitter made by Reis, a model of which is among the exhibits in the case, was a block of wood having a conical perforation with a membrane diaphragm covering the smaller end. A strip of platina was fastened to the center of the diaphragm upon which rested a platina point located upon a thin strip of metal. This point with the platina strip upon the diaghragm were the terminals of the circuit.

In another form the diaphragm was fastened to the smaller end of a metal cone; a pivoted lever was held by a light spring in contact with the center of the diaphragm, and the other end of the lever was in contact with an adjustable spring.

In both of these forms, as well as in the other modifications, which it is not necessary to describe, the contact point is so arranged that it does not follow the retreating membrane responding to the air vibration, but an

interval occurs which intercepts the next outward movement of the diaphragm. During part of a vibration the two electrodes approach each other, move together, separate, and then move in the same direction but not together.

In 1869 Mr. Vanderwyde exhibited and made public experiments with the Reis apparatus in the city of New York, and shortly after published a description of the instrument used by him. In his description he distinctly states that it is entirely clear that no quality of tone can be transmitted. "Much less," he says, "can articulate words be sent, notwithstanding the enthusiastic prediction of some persons, who, when they first beheld this apparatus in operation exclaimed that, 'Now we would talk directly through the wire.' It is, from its nature, able to transmit only pitch and rythm, consequently melody and nothing more"

The theory now is that the Reis apparatus really embodied the method of microphone transmission and that its mechanism will operate to vary the resistance in the electric circuit. Mr. Vanderwyde is produced and testifies that he considered at the time of these experiments that the mechanical action of the adjustment was an alternate make and break of the current, but he now has learned to understand it better and is convinced that the vibration of the diaphragm supporting the platinum foil produces a more or less intimate contact between that foil and the platinum point, and thereby produces a variation in the resistance to the battery current, resulting in a corresponding variation in the amount of current transmitted.

It is asserted in argument by defendants' counsel that the Reis apparatus needs "but the mechanical improvement of the apparatus, such as a slight weight on the top of the platinum rod, or a substitution of carbon for the electrodes, to make that apparatus a better speaking telephone than can be made of the Bell apparatus, as described in his first patent." The testimony of Mr. Yeates may be referred to as illustrating the character of the mechanical modifications which are practicable. After describing some improvements made by him in the receiver, he says he turned his attention next to the Reis transmitter, and discovered "that the chief defect in it was the too freely tossing of the little contact pin from the platinum plate on which it rested;" and the first plan which occurred to him to obviate this defect was to make the pin dip into a conducting fluid, and he made the experiment by simply wetting the pin with his tongue. He states that this greatly improved the sounds transmitted, and shortly after, when experimenting with the instruments, songs sung into the transmitter were distinctly heard, and some of the words were clearly recognized at the receiver in another part of the building. What modifications were made by him intermediate to his first and later experiment are not described. As the experiments of Mr. Yeates were made in England, the evidence is only important for the purpose of showing the capacity of the Reis apparatus, with mechanical modifications, to anticipate the invention of the speaking telephone. After Bell has pointed out the way, it may now seem to be a simple thing to introduce his method into the Reis apparatus. Some of the experts have doubtless convinced themselves that these modifications of the Reis apparatus do not involve any difference in the principle of the apparatus. It is too late to accept this theory after the lapse of so many years of fruitless experiment with the method of Reis, as originally suggested by Bourseul, and with the apparatus of Reis as modified by various experimentalists down to the time of the promulgation of Bell's method. It seems impossible to escape the conviction that, had the speaking telephone been left where it was left by Reis, and by those who endeavored to develop and perfect his theory, it would only have realized the speculations of Bourseul. The testimony which has been introduced by the defendant only serves to confirm the opinion of Judge Lowell "that a century of Reis would never have produced the speaking telephone by mere improvement in construction."

The answer alleges the invention and public use of the speaking telephone by various persons named therein prior to the invention of Bell. The argument of counsel has been addressed to the question of priority as between Bell and one Holcomb, and as between Bell and one Beardslee, who is not named in the answer as a prior inventor.

Holcomb asserts that he made his invention in 1860. His theory is that in the winter of 1859–60 he invented a polarized electro-magnet, which was an extremely sensitive one, and was capable of receiving articulate speech and was patented by him in May, 1860; and about the time of procuring that patent he conceived the idea of converting the force of the human voice into electricity; that early in the fall of 1860 he constructed a telephone consisting of one of his polarized magnets—a wooden diaphragm, mounted on a box or mouth-piece, and a U-shaped soft iron armature, attached to the diaphragm, extending towards and in proximity to the ends of the polar extension of the magnet, but not touching them, the diaphragm box and the magnet being secured to and held in their relative positions by a base common to both. He states that soon after completing this instrument he made a duplicate of it, and connected the helices of both of the magnets in a complete or closed electrical circuit; that while listening to one of the instruments he was able to hear and recognize articulate words spoken into the mouth-piece of the other instrument by other persons, and that he used these instruments on several occasions and showed them to several persons. He states that his telephone then embodied all the essential features of the present telephone.

He did not file an application for a patent until January, 1878. The instruments which he says he constructed are not produced, but all the parts are lost except a permanent steel magnet, a sounding box, a steel bow with a brass attachment, a brass clamp, and some broken pieces of the diaphragm. No witness is produced in corroboration of Holcomb who heard the instruments used except Holcomb's wife, or who were present when they were used. Several witnesses are produced, however, men of intelligence, who were interested in Holcomb's electrical mechanism, and were more or less familiar with what he had accomplished, but none of them seemed to be aware that he claimed to have succeeded in transmitting speech by the apparatus which he had made. In June, 1861, he obtained a patent for other electrical mechanism. From 1862 or 1863, to 1875, he does not seem to have made any efforts to perfect his telephone mechanism, and it was not until Bell's invention had attracted general public interest that he resumed his efforts to perfect it. During this period he was so indifferent to the importance of what he had accomplished, that he suffered the instruments which he had made to be lost. He was not in indigent circumstances, and it appears that he bought a farm in Maryland in 1862. He was fully competent to appreciate the great merit and value of his invention if he had actually succeeded in transmitting speech with his mechanism. He does not vouchsafe any explanation why for a period of 15 years he permitted his invention to lie dormant. The presumption of priority and validity arising from the grant of letters patent cannot be overthrown by a case like this; it suggests too many improbabilities to merit serious consideration.

In August, 1878, a suit was brought by the present complainants against the Western Union Telegraph Company for infringement of the patent in suit. Mr. Pope was then the electrician of that company, and was aware that Holcomb had made an application for a patent. The company set up the priority of Holcomb among other defences in that suit. Mr. Pope investigated Holcomb's pretensions, and had an interview with him in reference to the defence of the suit. He questioned Holcomb to ascertain whether he could produce any witnesses to substantiate his statement that he had transmitted articulate speech by means of his apparatus. Holcomb could tell him of no living witness. As a result of this interview Mr. Pope concluded it was not advisable for the Western Union Telegraph Company to purchase Holcomb's rights, and Holcomb was not called as a witness to substantiate the defence. The impression produced upon Mr. Pope was such as would be derived by any sensible man by an investigation of the facts and circumstances.

For the purpose of corroborating Holcomb the defence produced Mr. Beardslee as a witness; he testified that Dr. Bradley, an acquaintance of his, brought Holcomb to see him, and he described an instrument which Holcomb exhibited to him on that occasion, which he thinks was some time in 1861 or 1862. He testified that Holcomb claimed that by the use of such instruments he could communicate sounds and words at a distance through an electric current. Upon the cross-examination of this witness he testified that he himself made immediately after that interview several organizations to test for his own satisfaction the correctness of Holcomb's assertions about his instrument. He said the instrument thus made demonstated that the human voice could be conveyed by the means pointed out by Holcomb, but he saw nothing to indicate that they would operate at great distances and he never took any further interest in them, but regarded them as a mere toy.

Upon this testimony it is urged for the defendants that the Beardslee instruments defeat the novelty of the patent. It suffices, without further remark, to say of this defence that the instruments are not produced, and were never publicly used, and that the witness who is a mechanical engineer fully qualified to appreciate their merits never regarded them as of any practical value.

The questions respecting the novelty and infringement by the defendants of the several claims of the second patent in controversy have not been discussed by counsel. The fifth claim of that patent is "the formation in an electric telephone such as herein shown and described of a magnet with a coil upon the end or ends of the magnet nearest the plate. The novelty of the magnet described in the specification is controverted by defendants' expert, Mr. Young, and he relies upon a reference to the magnet in Hughes' Printing Telegraph as described in Schellen's work. This reference apparently describes the magnet of the patent. The claim is not for a combination of which the magnet is a constituent; and in the absence of any explanation upon the part of the complainants of the description in Schellen the novelty of tha claim seems to be negatived.

Infringement of all the claims of this patent is established by the testimony of Mr. Cross.

There should be a decree for the complaints upon the fifth claim of the first patent, and upon the sixth, seventh and eighth claims of the second patent.

.... In the Circuit Court at Baltimore, Wednesday, Judge Phelps displaced both Francis P. Stevens and T. W. Blakiston, rival receivers of the Postal Telegraph and Cable Company, and appointed Samuel Snowden, Samuel Sprigg and George W. Dobbin to manage the affairs of that company.

.... Judge Bond has appointed Edward Harland, of Norwich, Ct., as receiver of the American Rapid Telegraph Company of Baltimore, Md., at the solicitation of the Boston Safe Deposit and Trust Company, which holds a mortgage of $3,000,000 for the property of the American Rapid Company. The receiver is authorized to conduct the business of the company, and is required to give $5,000 bonds.

.... The Farmers' Loan and Trust Company of this city, and R. T. W. Duke, Jr., have procured an injunction from Judge Andrews of the Supreme Court, in a suit against the Southern Telegraph Company, restraining J. G. Farnsworth, as receiver of the Bankers and Merchants' Telegraph Company, and Joseph Fettretch as trustee, from selling, transferring or otherwise disposing of the bonds of the Southern Telegraph Company in their hands or under their control.

TELEGRAPHIC

.... There are 13,224 miles of telegraph lines in Mexico. Since September last 400 miles have been erected.

.... Included in the course of instruction at the Engineers' Camp, near St. Petersburg, is the work of construction and destruction of telegraphs and railways.

.... While digging holes for telegraph poles on the plains, seven miles from Merced, Cal., the workmen struck a stream of water within three feet of the surface.

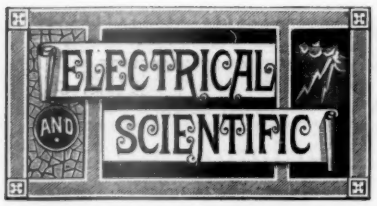
.... The Postmaster-General has fixed the rates to be paid for the transmission of Government telegrams during the next fiscal year. The new rates will be substantially the same as those now in force.

.... To people who have been connected with the telegraph business in a capacity which would make them familiar with prices of supplies for the past ten years, it is rather interesting to note the prices of Morse instruments, as given in the Western Electric Company's advertisement. We can remember when the prices of similar instruments were four times as much. The reduction is not on account of deterioration in quality, as the instruments are just as finely made and of just as good material as those that made the reputation of the Western Electric Company. The reduction is on account of the larger quantities manufactured and the improved processes of manufacture, and is, therefore, a true index of progress.

. .. The Central & South American Telegraph Co. has secured a commission to establish cables between Buenos Ayres and Rio de Janeiro, and land lines between Buenos Ayres and the Pacific side, thus securing continuous and independent telegraphic communication between the United States and Brazil. The necessary decree has been signed by the Argentine Republic.

.... The Western Union Telegraph Company has begun an action in the United States Circuit Court against the Baltimore & Ohio Telegraph Company for an injunction restraining the latter from using a certain kind of "condenser" in the duplex system of telegraphy. The motion for an injunction during the pendency of the action came for argument before Judge Wallace. Grosvenor P. Lowry and Edward R. Bacon appeared for the Baltimore & Ohio Co. in opposition to the motion. Gen. Duncan and Mr. Dickenson appeared for the Western Union Co. The hearing on the motion was adjourned to July 17.

.... Recently a gentleman of an ingenious cast of mind, connected with a banking institution in this city, thought of a method by which telephoning could be carried on in a whisper. This method is as simple as it is ingenious. He took a sheet of thick manila brown paper, folded and pasted it into the form of a cone or tunnel, some fifteen inches in length, the small end being just the size to fit into the transmitter orifice, without, of course, coming in contact with the diaphragm, and the large end being about six or eight inches in diameter. With this simple affair he can send messages in a whisper, or in so low a tone of voice that persons within two feet of him cannot hear what he is saying, while the party he is in communication with can hear every word as distinctly as if he spoke in a high key in the ordinary way to the transmitter. The sound waves of the voice which are projected into the tunnel are all utilized by this device, and intensified, and, therefore, act with more energy than if there were no special means of conveying them directly to the transmitter. The gentleman who originated this simple device has communicated his discovery to one of his business connections, who also uses the tunnel, and they can now by this device communicate with one another in whispers. Is not this an important improvement in telephones? And the inventor gives it to the world without patent or desire for royalty.



* * Improved cabs in England are now provided with electric bells to signal the driver.

* * A new process has been discovered, it is said, by which hoop iron can be made out of inferior pig iron by the use of pure sulphur, which removes deleterious elements.

* * The work of placing lightning-rods on the roof of the Washington Monument has been completed. It is thought that all danger to the monument from lightning will now be averted.

* * In Nevada it is said that there are luminous tree; that is, their foilage gives out light enough to enable one to read print, while the luminous effects may be seen miles away. The cause is an abundance of luminous parasites.

* * A remarkable effect of low temperature has been pointed out to the Glasgow Philosophical Society. At about 122 degrees below zero, Fahrenheit, the flesh of animals, such as mutton, becomes so exceedingly hard as to ring like porcelain when struck, and it may be readily crushed to a fine powder. More singular still, microbia living in the flesh before freezing, have been seen alive after thawing, even after an exposure of 100 hours to the intense cold.

* * A correspondent, referring to the description of the ammoniaphone published in a recent issue of the *Supplement*, suggests that a valley whose atmosphere was *almost saturated* with peroxide of hydrogen and free ammonia gas, would doubtless produce a heavenly voice, but that its melodies would only be heard in a place far more beautiful even than Italy. Such a peaceful spot might not produce a Guiglini, but it would very speedily produce something more ethereal.

* * The Council of the Society of Telegraph Engineers and Electricians, England, have the intention of appointing a committee, or rather to hold a congress, with a view to reform the ordinary terms, signs, and notation of electrical science. Delegates from the French International Committee, which have already dealt with this matter in France, will be invited to attend, the names of M. Blavier and M. Hospitalier being mentioned. Other gentlemen will be invited, whose co-operation is likely to be useful, whether they are professed electricians or physicists.

* * At a recent church festival at Cotopaxi, in Mexico, a band of thieves conspired to extinguish the electric lights in the cathedral, and take advantage of the confusion and darkness to rob the people assembled there. The leader of the gang threw a wire over the electric light wire, with the intention of drawing it down and opening the circuit; but some other ground contact permitted the electricity to pass through his body, killing him instantly, and serving as a terrible example in wait for one about to commit the sacrilege of a church robbery. The members of the gang made good their escape in the confusion caused by the tragic death of their leader.

* * It is not generally known that there are in successful operation in West Virginia two tin mines. One is near the city of Huntington, in Cabell County, and the other about five miles from Grantsville, in Calhoun County, on Laurel River. Unfortunately, it is a considerable distance from a railroad, and on very bad ground for hauling. The Calhoun County mine, which is the most extensive, is owned by State Senator T. J. Farnsworth, of Buckhannon, Tenn., and B. Ridgeway, of Staunton, Va. Two years ago all this land was regarded as comparatively valueless, except for the splendid timber, and was a slow sale at fifty cents an acre. The same property is now held at hundreds of thousands of dollars.

* * The depression of the past year or two has done more than prosperity could possibly do to stimulate invention and urge mechanics to find cheaper ways of doing things, and of getting greatest results from the same power and the same capital.

* * At a recent meeting of members of the Royal United Service Institution, Mr. F. Gower, the well-known inventor of a form of Bell telephone, lectured on a proposed new military weapon in the shape of aerial torpedoes, which could be propelled through the air by balloon agencies, and caused to explode dynamite or some equivalent material against an enemy's position. The chief danger of such a missile would probably be at night, when in the darkness its flight could not be easily seen. The idea at least deserves mention as a possible extension of military operations in the future.

* * Thomas A. Edison and Stephen D. Field have pooled their patents on appliances for electric motors. Mr. Field said, recently: "Within two months the electric motors will be as complete a success on the elevated railroad in New York as horse cars are on Broadway. We are now laying rails for electricity between the tracks of the Second Avenue Elevated Railroad from Chatham Square to Harlem, and if we cannot run over the whole line, I am willing to acknowledge the thing a failure. Our trial proved that not half enough has been claimed for the electric motor. All electricians who have seen the motor work declare the problem solved, so far as the electrical part is concerned."

* * Dr. Schaper recently demonstrated to an audience the magnetic induction exercised by the earth. A number of telephones were arranged in series upon one circuit, which was rapidly made and broken by an interrupter. A telephone was then repeatedly turned end for end in such a way that its north and south poles were alternately the uppermost, and at each reversal a crack was heard in all the telephones, resulting from the induction of the earth on the central magnet. If the experiment be made with an induction bobbin only, the crack is extremely feeble, due in that case to the induction of the earth on the bobbin. The telephone may be replaced by a magnet wrapped with insulated wire. The degree of sensibility of the telephones can be determined if the axis of rotation of the magnet employed in the experiment be brought little by little nearer to that of the inclining apparatus.

* * The electric flow obtained from the rheostatic machine of Plante discharged "in quantity" has peculiar properties which are not obtained from the ordinary voltaic current or from ordinary electrostatic apparatus. These effects, according to Plante, are both mechanical and calorific; the mechanical being the more important. When a platinum wire ($\frac{1}{10}$ millimeter thick) is traversed by the discharge in question, nodes of vibration appear in the wire at regular intervals. If the current be sent into a small mica plate condenser, and is sufficient to pierce it, the mica is shivered into fragments and a continuous series of sparks is produced. If a platinum wire, connected to one pole of the machine, be introduced into a capillary tube open at one end, but having the other plunged into acidulated water in connection with the other pole of the machine, the salt water is found to leap in the tube at every spark, and, having no time to descend again, thus rises by steps in the tube. This experiment is pointed to by M. Plante as offering, perhaps, an explanation of a singular effect of lightning which took place at Ribnitz, in Mecklenburgh-Swerin, on July 30, 1884. On that occasion the lightning struck a house, pierced a hole in a window on the first flat, and was accompanied by the sudden appearance of a jet of water that seemed to come from the ground against the building. M. Plante is inclined to attribute the peculiar properties of his machine to the dielectric medium between the armatures. This medium is not an electrolyte, but a solid elastic plate of mica, but it is subject to a "charge" and "discharge" in the action of the machine.

The International Inventions Exhibition.

DYNAMO-ELECTRIC MACHINERY.

By W. M. Mordey.

Probably for the general public, and certainly for the electrical world, the electric lighting apparatus will prove to be the most interesting and important of all the displays at the Inventions Exhibition. Whatever other solid educational results the Exhibition may have, it cannot fail in impressing on the public the fact that electric lighting has now so far emerged from the experimental stage as to have fully entered on its career as a practical commercial branch of engineering. And, before all things, it is perhaps necessary to the extensive application of electricity in the immediate future that the public should be satisfied on this point, in order that the feeling of skepticism or uncertainty, which is one of the barriers to house-to-house lighting, may be removed. Many reasons have been given for the slow progress hitherto made in this country in the application of the electric light, and no doubt the causes of this slowness are very numerous and varied; but, perhaps, it has not been sufficiently recognized that the public are not yet educated up to the point of a confident belief in the possibility of successful electric lighting on a large scale. The attitude of the man who would not go into the water until he had learned to swim, is very like that of the public with regard to this matter. Until a town, or a considerable portion of a town, has been lighted by electricity, it may be said that it will be very difficult to get a town lighted electrically. But here in the Exhibition may be seen electric lighting, approaching in amount that necessary for a town district, successfully carried out under conditions that are distinctly unfavorable from the suppliers' point of view. It may not be too much to hope that this Exhibition will at least do a great deal to remove any prevalent feelings of uncertainty, and that visitors may be not only pleased and dazzled by all that electricians have to show them in the grounds and in the Exhibition buildings themselves, but that their minds may be fully opened to the solid commercial possibilities of this new department of engineering.

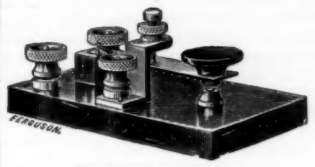
The first feeling produced in the mind of an observant visitor to the Exhibition, who is acquainted with the general principles of apparatus for the generation of electricity, will be one of some disappointment at the absence of anything at all approaching to a startling novelty; but a little consideration ought to convince him that this absence of new things is really a most hopeful sign, showing, as it does, that the construction of electrical machines has settled down into certain grooves which have been proved by experience to be the best; and that, therefore, the element of permanency has been introduced into the manufacture. It is not that inventors and scientists have been idle during the past year or two, for readers of contemporary scientific literature well know that a very great number of earnest workers have been, and are, engaged in the investigation of all questions relating to the application of electricity, and that no point has received more careful attention than the dynamo machine. It may, therefore, be taken for granted that if inventors have little or nothing new in principle to bring forward, it is because they are satisfied that known types of machines contain in them the elements of the greatest attainable perfection, and that progress is not so much to be sought in the direction of new forms as in the careful study of old ones, with a view to the elimination, as far as possible, of all prejudicial actions and causes of loss. Thus it is to be noted that while few, if any, of the dynamo machines at work or on exhibition contain anything essentially new scientifically, many of them show that great attention has been given to all such points as render them capable of working economically and satisfactorily for long periods. The machines are, for the most part, well and soundly constructed mechanically. They are much less likely to break down or get out of order than was the case a year or two ago, while attention has been given to practical details, such as facilitate examination and repair, and enable the operations of taking to pieces or putting together to be easily carried on. The opportunity afforded of observing the working, as well as studying the construction, of the Thomson-Houston apparatus will be welcomed by English electricians, who have only hitherto been made acquainted with this system through the medium of the technical press; the machines now shown being, we believe, the first that have reached this side of the Atlantic. It is an interesting, and, perhaps, significant fact, that almost all American electric light inventions consist of "systems" more or less fully developed and self-contained. If we glance at the principal importation of this class from the United States—the inventions of Edison, Brush, Maxim-Weston, Hochhausen, and now of Thomson-Houston—we see not a separate dynamo in one, and a new lamp in another, but a full set of apparatus worked out in all or most of the details necessary for actual installation; and including dynamos, methods of current or electromotive force regulation, lamps, cut out, meters, conductors and fittings. This attempted completeness, which is at least as striking in this the latest arrival as in any of the others, well illustrates the inventiveness of our American cousins; and shows, also, their keen practical commercial instinct.

While engaged in noting the general impression produced on the mind by what is to be seen at the Exhibition, it may not be out of place to say a few words about some things that are conspicuous by their absence—some inventions that might have been expected to be shown. There is no doubt that for some time there has been "in the air" a sort of ill-defined idea that there was nothing permanent about the present principles employed in the construction of dynamos, and that some great discovery might be expected that would completely revolutionize existing methods, and enable electricity to be generated with great ease and vastly increased economy. Such expectations as these are no doubt inseparable from the existing general state of popular knowledge of electrical principles. At the same time it must be confessed that it is not only among the general public that these ideas are met with—there are recorded opinions expressed by one or two well known men which have, perhaps, been taken too literally, and a public accustomed to startling revelations of science, especially electrical science, has seized on them in its blind belief that nothing is impossible to science.

We have said that the absence from the Exhibition of anything very new in principle, or new in the application of an old and known principle, was rather a healthy sign than otherwise, because it tends to allay all feeling of expectation of the sort we have mentioned. If we try and trace these ideas back to their source we shall find—where they have any distinct form at all—that we are led in one direction to "unipolar" induction, and in another direction to thermo-electricity. With regard to "unipolar" induction—to employ the unfortunate and misleading term, of Continental origin, by which the magneto-electric induction of continuous currents, without commutation is known—it may be said at once, we think, that although the principle holds out a promise of practical use for certain purposes where low potential and large quantity are required, it is very unlikely that for other purposes than these it will ever meet with extensive application. But even if it be supposed, for the sake of argument, that machines may at some future time be constructed on the principle of "unipolar" induction, capable of producing high electromotive forces suitable for general employment, it would be easy to arrive at the conclusion that no great advance in economy of electrical production could result, since existing forms of generators now succeed in returning, as electrical energy, so large a proportion of the mechanical energy expended in them that further advance in this direction is practically impossible. We are well within the mark when we say that any

fair commercial dynamo will account electrically for 90 per cent. of the power delivered to it, and will give 80 per cent. as a useful commercial return. It must therefore be evident that, as far as economy in the generation of electricity is concerned, when a steam engine or other source of motive power is relied on, no further substantial improvement is possible in the electric generator. But no doubt the advocates of "unipolar" machines would say that, in the matter of the collection of the generated current, a machine without a commutator offers practical advantages over all ordinary commutating machines. This argument was freely advanced three or four years ago in support of alternate current dynamos, although in some of these machines the collection of the current does not appear to be very simple, being certainly not less troublesome than in many continuous current generators; while it is only necessary to examine the majority of the dynamos working in the shed, and elsewhere in the Exhibition, to be convinced that the difficulty of collecting even in very large continuous currents has practically disappeared, little or nothing remaining for improvement in this direction, and that little being attainable by known means. Of course in a "unipolar" dynamo the collection of any given current by some form of rubbing contact must always be less difficult than the collection of the same current from a commutated armature (assuming that the velocity at the contact is the same in the two cases), because the latter, in addition to the electrical resistance and mechanical friction, there is a certain amount of difficulty produced by the act of commutation. But, seeing how small is the objection to ordinary dynamos on this ground, it is not likely, even if they could be made suitable in other ways, that in this matter of current collection "unipolar dynamos" can ever be expected to offer such great advantages as to lead to their extensive use. The trouble, such as it is, in these machines might be completely overcome by making use of stationary armatures and revolving field-magnets, although it is probable that the great mass of the latter would stand in the way of such a solution of the question. So that on no sufficient ground is there reason to believe that any radical change in the principle of generating machines is in store for us.

But while it is clear that no great improvement in this direction is to be looked for, it must not be forgotten that the dynamo is only one of the agents concerned in converting the heat energy of the coal into electrical energy, and that the great loss is in the steam generator and motor. The fact that so large a proportion of the energy of the fuel is lost has led to many attempts at various times to obtain electricity by the application of the principle discovered by Seebeck, that an electromotive force was produced by heating the contact junction of two dissimilar metals. And quite recently a fresh impetus has been given to the consideration of the subject, and a certain amount of rather wild anticipation has been indulged in by a portion of the public, as a result of some observations reported to have been made by Mr. Edison to some journalists by whom he was interviewed. From the newspaper paragraphs we learn that Mr. Edison is engaged in an attempt "to get electricity direct from the coal." This may reasonably be supposed to mean that he is trying to find a practical and satisfactory form of thermopole, capable of being used for the production of the large currents necessary in electric lighting and distribution of power. A great many attempts have been made in this direction, but never with any very good results. At the Health Exhibition last year a large thermopile was in course of construction in the dynamo shed, but it appears that it either was not completed, or was not found to act satisfactorily, as it was never exhibited; and no account of it, as far as we are aware, was published. The difficulties attending the construction of large thermopiles are apparently very great. The metals most suitable for the purpose are of high specific resistance, and the high temperature necessary to obtain good results, besides increasing the resistance, appears to render the maintenance of the junctions by no means an easy matter. The resistance can be reduced by increase of the cross-section of the elements, but this is objectionable for several very good reasons. Until the elementary difficulties are overcome, it is almost unnecessary to inquire into the question of how far the problem of the economical employment of fuel can be solved by means of thermopiles; while it must be recognized that were the solution even as satisfactory as Mr. Edison could desire, it could not lead to results as regards efficiency surpassing the generation of electricity by dynamo machines driven by plentiful water power.—*London Electrician.*

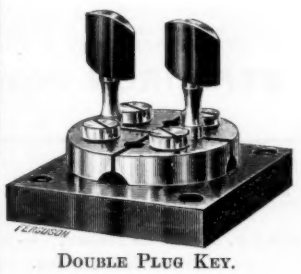


COMBINATION KEY.

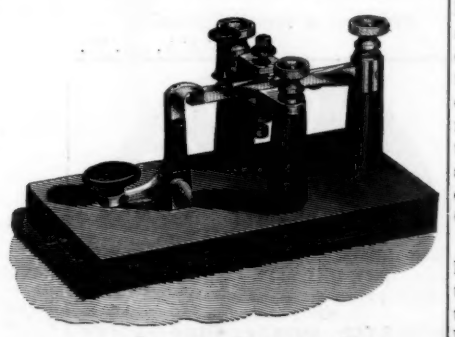
REVERSING KEY ON PILLARS.

Testing Instruments.

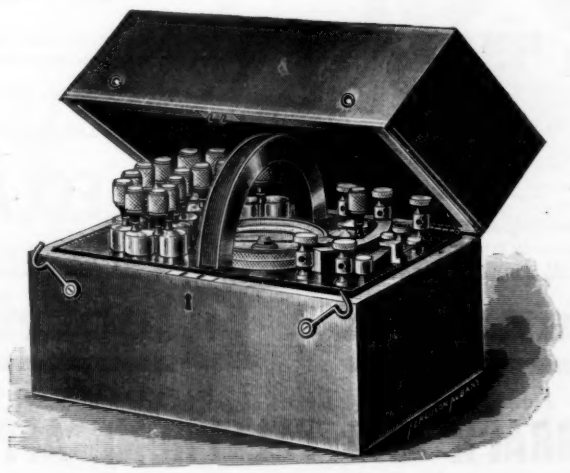
Improvements in electrical instruments for testing are rapidly being made by all our leading manufacturers of electrical apparatus, and it is not found necessary to import these costly instruments any longer from Europe, as home manufacturers already excel them. We were recently shown some of the finest electrical testing instruments that we have ever examined, manufactured by the Electrical Manufacturing Company, of Troy, N. Y. We illustrate a few of their keys, and also the Bailey combination testing set made by them. This instrument has been designed to meet the wants of electricians, students and others who wish a compact and portable testing set, which will enable them by following the printed instructions (accompanying each set) to make with sufficient accuracy all necessary measurements. It consists essentially of a three-coil tangent galvanometer, a rheostat and combination key, contained in a mahogany case. There are thirteen coils in rheostat, 1,443½ ohms in the aggregate, and are, respectively, ¼, 1, 2, 3, 7, 10, 20, 30, 70, 100, 200, 300 and 700 ohms. We will in another issue illustrate some very excellent designs of galvanometers, resistance coils, etc., which this new firm are turning out.



DOUBLE PLUG KEY.



IMPROVED DISCHARGE KEY.



THE BAILEY COMBINATION TESTING SET.

—— Staunton, Va., and Kansas City, Mo., are negotiating for the establishment of incandescent electric light plants.

—— The use of electric lights on athletic grounds has been tested for a few weeks at Williamsburg, L. I., where the grounds of the Williamsburg Athletic Club are now lighted by electric lamps. By their light games were carried out in the evening.

—— Dr. J. F. Boynton, of Syracuse, N.Y., telling of his six weeks' trip in the western country, says: "At Elgin, Illinois, I was not only interested in their watch factory and their factory for condensing milk in a superior way, but also in their magnificent system of electric lighting. The effect produced is that of half moonlight over every part of the city. There are seven towers with several lanterns on each tower, each light of 2,000 candle power. By this system none of the dazzling, glaring effects, and the contrast of gloom and brightness, which characterizes low lighting, is seen, but the radiance is soft and diffused, which is the best for protection, safety, and general usefulness. The light on each tower extends over a radius of 2,000 feet, and can be seen for several miles. Elgin claims to be the best lighted city in the world, and is just now attracting great attention on that account. The Hon. George S. Bowen, who has had charge of the work, has done it in a most satisfactory manner."—*Syracuse Herald.*

ELECTRIC LIGHT NEWS

—— Evansville, Ind., is greatly pleased with the Brush electric light plant that has just been installed. The tower system is used, and ten have been erected.

—— One of the most recent innovations of modern science is the introduction of the electric light into the old, primitive city of Venice. It was considered a sacrilege when boats propelled by steam were a few years ago introduced upon the canals of that quaint city, but the people became accustomed to them, and they will soon get used to the electric light, which will add brilliancy to the city, if not picturesqueness to a gliding gondola.

—— In Hartford, Conn., at the works of the Electric Light Company a foundation is being laid for the new engine, which will be put in place about the first of July. It will be a double disc engine of ninety horsepower, from the works of Armington & Sims, Providence. Two forty-five light dynamos are to be added to the present plant, and an addition to the buildings is being put on to accommodate the increased facilities for furnishing light.

—— The Great Northern Railway, England, are lighting one of their trains with accumulators, placed in each coach. The cells are charged by a dynamo driven from the axles, and a magnetic switch closes the circuit when the electromotive force of dynamo rises above that of the cells. The Electrical Power Storage Company have lately supplied accumulators for use on the Lancashire & Yorkshire Railway, as well as the Great Eastern Railway.

—— The six electric light towers which have been erected were lighted last night for the first time, casting a glitter of light over the city that was grandly beautiful. The lights are said to have been seen out on the country roads for a distance of five or six miles. Three or four more towers will be erected, and a number of hanging lights put in position at street crossings before the city is permanently lighted as per contract.—*Journal, Fort Wayne, Ind.*

—— Our English contemporaries say that in lighting steamers through the Suez Canal the most efficient and safest apparatus is claimed to be the Siemens dynamo for the supply of electricity, and the search light constructed by MM. Sautter and Lemounier, which has proved much more effective than the larger English lamps. We would suggest that they try some of our American styles of dynamo machines, when they can, without doubt, find a half-dozen kinds quite equal to, and perhaps better than, the Siemens.

—— The lighting of our city by the electric light is a grand success. Our excellent system of using the tower in the suburbs and mast arms in the business part of the city has no equal. Traveling men claim that Fort Wayne is the best lighted city in America, and the *Gazette*, from observations elsewhere, heartily endorses their opinion. Every night the suburbs and outskirts of our city is bathed in perpetual moonlight, and our busy streets gleam bright and cheerful, the result of our magnificent street lighting.—*Fort Wayne Gazette.*

—— The Pennsylvania Railroad Company continues the experiments with lighting cars by electricity from Brush storage batteries, using the lights on a train running between Altoona and Pittsburgh. The arrangement has worked satisfactorily. The storage batteries are charged in the company's shops by connection with a Brush dynamo-electric machine. It takes about nine hours' running to charge the batteries with sufficient electricity for the round trip. The intention is, should the plan be found advisable for general use on through trains, to establish electric plants at different stations for charging the batteries.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JUNE 23, 1885.

320,515 Electro-magnetic reciprocating engine; Charles J. Van Depoele, Chicago, Ill

320,542 Electrical game indicator for pool tables. Elias Curtis, Kansas City, Mo.

320,547 Medical battery; Otto Fleming, Philadelphia, Pa.

320,585 Electric arc lamp; Gustave Pfannkuche, Hartford, Conn., assignor to the Schuyler Electric Light Co., same place.

320,606 Electric lighting device for gas burners; LeRoy S. White, Waterbury, Conn.

320,630 Electric Switch; Leo Daft, Greenville, N. J.

320,631 Insulator for tracks; Leo Daft, Greenville, N. J.

320,632 Electric conductor; Leo Daft, Greenville, N. J.

320,633 Insulator for tracks; Leo Daft, Greenville. N. J.

320,679 Electrical railway; Wm. Paynter, Baltimore, Md., assignor of one-half to Louis R Keizer same place.

320,684 Method of making electrical conductors, Wm. S. Platt, Waterbury, Conn.

320,685 Electric bell; Henry B. Porter, Chicago. Ill.

320,717 Induction coil; Wm Stanley, Jr, Pittsburgh, Pa.

320,739 Incandescent lamp; John A. Yunck, Sharon Hill, and John Stuertz, Philadelphia, assignors to Henry C. Terry, trustee, Philadelphia Pa.

320,754 Armature for dynamo-electric machines; A. H. Bowman, Packerton, Pa.

320,840 Regulator for dynamo-electric machines; C. L Buckingham, New York, N Y.

320,841 Electric arc lamp; C. L. Buckingham, New York, N. Y.

320,842 Regulator for dynamo-electric machines; C. L. Buckingham, New York, N. Y.

320,843 Electric arc lamp; C. L Buckingham, New York, N. Y.

A printed copy of the specification and drawing of any patent to the annexed list, also of any patent issued since 1865, will be furnished by any of the patent solicitors whose advertisements appear in this journal. In ordering please state the number and date of the patent desired.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40.00. Various other Foreign patents may also be obtained.

BUSINESS NOTICES.

Electric Light Companies, Manufacturers of Electric Light Apparatus, Machinery and Supplies, who desire to become members of the National Electric Light Association must make application on or before August 1st, 1885. All communications addressed to J. F. Morrison, President N. E L. Association, Baltimore, Md., will receive prompt attention.

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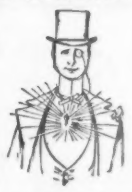
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We think it is what has been wanted.—*Holmes, Booth & Haydens, New York.*
It is a valuable publication.—*Salem Electric Lighting Co., Salem, Mass.*
It will make a very convenient desk volume.—*The Brush Electric Light and Power Co. of Niagara, Niagara Falls.*
It is a valuable book and fills a want long felt—*The Brush Electric Light Co., Buffalo, N. Y.*
It is a very useful and valuable book for reference and general information.—*Oskaloosa Gas Co., Oskaloosa, Iowa.*
It is filled with much new and useful information—*Judge W. H. Moore, Huntsville, Ala.*
It is something that has been needed.—*Wells W. Leggett, Detroit, Mich.*
We are well pleased with it.—*Jarvis Engineering Co., Boston, Mass.*
We consider your publication a valuable one.—*The Edison Co. for Isolated Lighting, New York.*
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